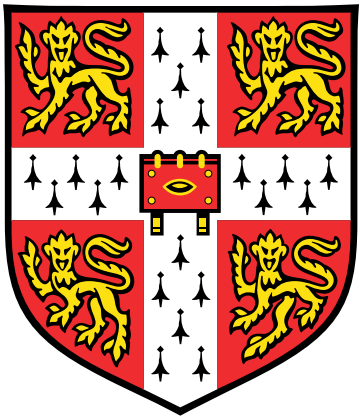
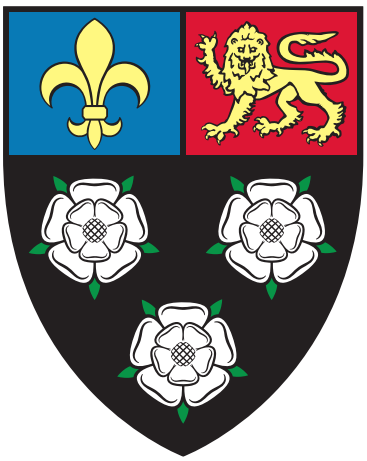


Three Essays in Asset Management

Ethical and Investment Exclusions



Vaska Charlz Atta-Darkua

Judge Business School

University of Cambridge

This dissertation is submitted for the degree of

Doctor of Philosophy

King's College

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Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared below and specified in the text.

Chapter 1 "Corporate Ethical Behaviours and Firm Equity Value and Ownership" is a sole-authored paper. Chapter 2 "The Long-run Consequences of Portfolio Sector Exclusion" is co-authored with my supervisors Elroy Dimson and David Chambers. I performed 60% of the work to produce the version in this dissertation. An earlier version of Chapter 2 was published by the Norwegian Ministry of Finance in their report "Energy Shares in the Government Pension Fund Global" (see Atta-Darkua and Dimson (2018)). The chapter uses updated long term sector returns data from the article "Industries: Their Rise and Fall" in Dimson, Marsh and Staunton (2015). Section 6.2 in the chapter also updates and extends commentary and data on industry and country concentrations originally presented in that article. Chapter 3 "Survey on Sector Exclusions" is co-authored with my supervisor Elroy Dimson. My contribution towards it is 70%.

The thesis is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. This dissertation does not exceed the 80,000 word limit set by the Cambridge Judge Business School Degree Committee.

Vaska Charlz Atta-Darkua

September 2019

Three Essays in Asset Management: Ethical and Investment Exclusions

Vaska Charlz Atta-Darkua

Abstract

This dissertation contributes to the existing body of knowledge on ethical and investment exclusions. Accordingly, the first chapter examines the consequences of ethical exclusions from the point of view of excluded firms. Specifically, it makes use of the Norway GPFGś ethical exclusion announcements and documents a post-announcement negative return impact on firms' stock prices which is not reversed in the short term. Furthermore, I find that product exclusion announcements influence some ethics-sensitive investors who also divest negatively screened firms. Therefore, the chapter demonstrates that ethical exclusions can adversely affect firm equity value, at least in the short term. The second chapter examines the impact of sector exclusions on the portfolio of a long-term well-diversified investor. Using industry indices spanning 1900–2018, we identify a number of risks associated with sector exclusion strategies. Focusing on the part of the portfolio which is being substituted away from a given sector, we show that negative screenings can give rise to substantial drawdowns and unintended geographical tilts. We conclude that over the long run the consequences of sector exclusion for investors are likely to be non-trivial. The third chapter conducts a survey of industry professionals' views on divestments. Respondents consider negative portfolio screenings most useful for attracting funds from ethically concerned investors and are least in favour of using them for risk management purposes. Furthermore, professionals express the lowest levels of disagreement about the expected returns of non-controversial sectors, relative to those of controversial sectors. We also classify respondents into clusters depending on their opinions regarding sector exclusions. Those who are divestment "sceptics" form risk estimates with higher resemblance to historic performances than divestment "devotees". Overall, survey responses imply that exclusions scepticism does not stem from an expectation that controversial sectors have superior performance to non-controversial sectors.

I would like to dedicate this thesis to my parents Charles and Katya, who have always supported me in all my endeavours; to my two brothers Maykal and Viktor, who have been my lifelong accomplices and companions; and to my friends, who have never failed to add excitement and fun to my PhD experience.

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Last but not least, my deep and sincere gratitude goes to my beloved family for their continuous and unparalleled love, help, and support. This journey would not have been possible without them.

Table of contents

Introduction

In this dissertation, I have compiled three essays in the field of asset management. Specifically, I have focused on the practice of negative portfolio screenings. I examine how they can affect both excluded firms and the investors who engage in the practice. I also survey industry professionals on their viewpoints on sector exclusions.

Crucially, investment exclusions can be performed for multiple reasons, including ethical considerations not related to expected firm financial performance. Consequently, part of the thesis is dedicated to examining the impact of expressing ethical preferences via the practice. This is the case for Chapter 1, where I analyse investor reactions to ethical firm exclusions. Chapter 2, in contrast, takes a more agnostic view and examines the impact on investment portfolios when negatively screening both controversial and non-controversial sectors. Similarly, the survey in Chapter 3 allows for both financial and ethical motivations for exclusions to be considered alongside one another. I describe the three chapters in more detail below.

The first thesis chapter "Corporate Ethical Behaviours and Firm Equity Value and Ownership" analyses the consequences of ethical negative screenings from the point of view of the excluded firm, by making use of the Norway GPFG's[1] exclusion announcements. It documents a negative return impact which is not reversed in the short run. It also shows that the Fund's exclusions under the product criteria are followed by some ethics-sensitive investors. The implications are that firms lose value in the short term and can experience a reduction in their investor base over the longer term. I hypothesise that the two findings are connected whereby a reduced firm investor base leads to lower firm equity value at present and higher expected future returns. This is in order to compensate the remaining investors for experiencing increased portfolio risks by holding a higher number of firm shares than would be optimal for them.

Next, the second chapter "The Long-run Consequences of Portfolio Sector Exclusion" examines the impact of negative screenings on the portfolio of a long-term well-diversified investor. It takes a broader view on divestment and performs a general analysis which can apply to both ethical and non-ethical sector exclusions. A dataset for the UK and USA, from 1900 to 2018, is used to provide a long-run historic perspective on how sector exclusions would have

[1] Government Pension Fund Global

affected investment portfolios. We focus on the effect on the part of the portfolio which is being replaced by other assets. We identify a number of risks associated with sector exclusion strategies. One way of viewing negative screening is as allocating a portion of the portfolio to a strategy that is long the market and short the divested sector. However, sectors have substantially different returns from the general market, making the market a poor substitute for any one sector. Furthermore, such a strategy would introduce unwanted geographic tilts into the portfolio, and it could suffer substantial and lengthy drawdowns. Therefore, over the long run the consequences of sector exclusions are likely to be non-trivial for investors.

The third and final chapter of the dissertation is named "Survey on Sector Exclusions". In it we query industry professionals' views on the merits of various motivations to engage in exclusions. We document that they consider negative screenings to be most useful for attracting funds from ethical investors. This is followed by conforming to moral beliefs. Respondents deem risk management to be the least useful goal of the practice. We also segment our sample into three groups based on the exclusion preferences of respondents. These are "sceptics", "questioners" and "devotees". Using these clusters, we show that exclusions scepticism does not seem to be a result of a belief that controversial sectors have superior performance to that of non-controversial sectors. Moreover, negative screening "sceptics" form sector risk estimates with higher resemblance to recent historic performances than "devotees".

The remainder of the thesis contains the three chapters described above. References are listed separately within each chapter. There is also a separate References section at the end of the thesis in order to include work cited within the rest of the dissertation (Declaration, Introduction, and Conclusion).

Chapter 1

Corporate Ethical Behaviours and Firm Equity Value and Ownership

Corporate Ethical Behaviours and Firm Equity Value and Ownership: evidence from the GPFG's* ethical exclusions†

Vaska Atta-Darkua‡

Abstract

This paper investigates the implications for firm equity value and ownership structure when a large institutional investor publicly excludes a firm from its portfolio due to unethical behaviour. To achieve this, it makes use of the GPFG's ethical exclusions. On average, firms lose 1.72% of equity value around exclusion announcements, which is not reversed in the short term. For firms excluded under the product criteria, the effect seems to be driven by the divesting behaviour of ethics-sensitive investors.

JEL classification: G11, G14, G23, G31, M14

Keywords: ethical investing, equity value, clientele change, ethical behaviour, institutional investors, sovereign wealth funds, sin stocks

*The Norwegian Government Pension Fund Global

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1 Introduction

Ethical investing practices have gained attention in recent years, with an increasing number of investors employing Environmental, Social and Governance (ESG) and/or Socially Responsible Investing (SRI) factors in the construction and monitoring of their portfolios.[1] In the UK, the Department for Work and Pensions (2018) has proposed that some occupational pension schemes should disclose "how they take account of financially material considerations, including (but not limited to) those arising from Environmental, Social and Governance considerations, including climate change".[2] Furthermore, in the United States, the US Social Investment Forum (2018) calculates that total US-domiciled assets under management employing SRI strategies make up one out of four dollars of professionally managed assets. In consequence, while firms have traditionally been assessed primarily on performance metrics, they are increasingly facing pressure to disclose and improve their ethical behaviours.[3] If they fail to live up to investor standards they may face exclusion from portfolios and/or active investor pressure to change practices which are deemed unethical.[4] According to the Global Sustainable Investment Alliance (2018), negative/exclusionary screening is the largest global sustainable investment strategy, comprising $19.8 trillion out of $30.7 trillion. In particular, Arabella Advisors (2018) calculates that 985 institutions have collectively announced fossil fuel divestments of $6.24 trillion assets.[5]

This paper aims to investigate if ethical exclusions can affect firm equity value and whether this is due to firms falling out of favour with other ethical investors. The GPFG's ethical exclusions announcements are used as an experimental tool to conduct the analysis. They provide a unique and interesting setting as they are not based on the firms' financial performance but introduce detailed information to the market about their (perceived) unethical behaviour. Furthermore, the Fund has sold any firm shares which it owned prior at the time of announcement so information about the fund selling firm shares is separated from information about the firm's ethical behaviour. Crucially, exclusions are based not just on past perceived unethical behaviour, but also on reasonable beliefs that such behaviour will continue into the future.

There are several plausible ways in which equity value would be affected by a large institutional investor excluding a firm from their portfolio for ethical reasons. First, there could be demand-driven price changes whereby prices decline as fewer investors are willing to hold firm shares. This increases the non-diversifiable firm risk for investors still owning shares in the firms. On one

[1] Ram (2016), Oakley (2016), Global Sustainable Investment Alliance (2018)

[2] In addition, there is also an engagement clause, whereby the Statement of Investment Purpose (SIP) should describe "their policies in relation to the stewardship of investments, including engagement with investee firms and the exercise of the voting rights associated with the investment"

[3] Thompson (2017)

[4] Ralph (2017), Grene (2016)

[5] also see https://gofossilfree.org/divestment/commitments/

hand, such reduced investor base could be purely a result of investor ethical considerations. On the other hand, investors may also believe that ethical exclusions reveal bad firm fundamentals such as lower expected growth or higher firm risk. In both cases price changes should not be transitory in the short run but firms are likely to have higher expected returns in the future to compensate investors for the higher risks they are exposing themselves to. If investors are correct in revaluing firm fundamentals and risk based on the exclusions, we would also expect to observe changes to firm performance or risk metrics in the future.

A second potential consequence of the exclusion announcements could be investor overreaction. Then, there would be a short-term price decline and a subsequent price reversal. Third, a switch in the clientele base could also be at play. In such a framework, once unethical behaviour is revealed, ethically minded investors sell their firm shares. However, when prices decline, investors who do not use ethical concerns in their investment decisions would buy the reduced-price shares and push prices back up. The key difference between the mechanisms is (1) whether a price reversal is observed or not and (2) whether there is a change in the investor base of the firms. The paper evaluates the price reaction to the exclusion announcement as well as the observed ownership changes in order to determine which mechanism seems to best describe the setting. Preliminary analysis on firm performance is also described.

The analysis makes use of hand-collected information on exclusion recommendation announcements. The data on recommendations are collected from the website of the Norwegian Council on Ethics, and Norges Bank Investment Management(NBIM, for coal exclusions). The websites contain press releases, and individual recommendations for companies and specific sectors (e.g related to nuclear weapons). The exclusion announcement date is considered to be the date information of the exclusions was posted on the Council on Ethics or/and NBIM websites. The paper employs an event study methodology to analyse abnormal returns around the exclusion announcement dates. Ownership levels for institutional investor categories likely to be ethics-sensitive are examined before and after the announcement dates to determine if selling behaviour by ethics-sensitive investors[6] is present.

The events data consists of exclusions made by the GPFG for ethical reasons. The Fund is a large institutional investor and is currently ranked as the largest sovereign wealth fund in the world by the Sovereign Wealth Fund Institute.[7] It has assets of over 1TN USD, up to 70% of which can be allocated to equities. It invests in around 9,000 companies worldwide, owns 1.5% of the equity of all listed companies worldwide, and 2.57% of the equity of listed companies in Europe.[8]

[6]I define ethics-sensitive investors as those who incorporate firm ethical behaviour into their portfolio decisions and react to news of firm ethical behaviours. Investors who do not consider ethics in their portfolio selection and management are referred to as ethics-insensitive investors.

[7]https://www.swfinstitute.org/sovereign-wealth-fund-rankings/

[8]https://www.nbim.no and https://www.nbim.no/en/the-fund/how-we-invest/, Accessed in September 2019

The Fund provides considerable information to the public with regards to its decisions to exclude, monitor or re-include companies due to ethical reasons. Following exclusion (and any re-inclusion) decisions it makes a public announcement and in most cases also publishes a detailed report on the motivations behind the exclusion. Exclusions can be for product-based reasons (involvement with nuclear power, tobacco, coal, etc.) or conduct-based reasons (environmental damage, corruption, human rights violations, and so on) which adds further depth to the dataset.

Notably, exclusion recommendations are based on thorough research into the companies and as well as looking at past behaviour also rely on a reasonable expectation that such behaviour will persist in the future. This is in contrast to standard ESG metrics such as the KLD (Kinder, Lydenberg, Domini Research & Analytics), which measure past exposures.[9]. It is important to note that ESG is related to but not identical to the firm ethical behaviours which I analyse. In particular, ESG scores reflect company behaviour across a number of metrics so in practice subpar behaviour in one aspect could conceivably be compensated by stellar conduct in another. The GPFG and the Council on Ethics, on the other hand, judge company unethical behaviour in comparison to the moral standards that they believe companies should uphold. Therefore, if a company is found to breach one of their conduct or product criteria, they are excluded regardless of their behaviour across other dimensions. The concept of Corporate Social Responsibility (CSR) is also related to ESG. CSR practices cover firm activities related to Environmental and Social concerns[10], some of which will be picked up quantitatively by the E(nvironmental) and S(ocial) scores in ESG metrics.

Information on when a particular recommendation was submitted by the Council on Ethics becomes public once the recommendation decision is published.[11] NBIM physically divests any firms in which they own shares prior to the exclusion announcements. However, the exact sales date remains unclear.

The main results are the following. For ethical exclusion announcements, I document a negative return impact. On average firms lose $30.6 million around the announcement day (-0.94%, CARs[12] -1 to 0 days) and $168 million of Market Capitalization by day five (-1.72%, CARs-1 to 5 days). This suggests that ethical investing can affect stock prices in the short run. Furthermore,

[9] and have been criticised for not taking full advantage of publicly available data by Chatterji, Levine and Toffel (2009)

[10] The United Nations Industrial Development Organisation (UNIDO) defines CSR as "a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders, https://tinyurl.com/y5usp4fq, accessed in August 2018.

[11] Until 2015, the Council on Ethics would submit recommendations to the Ministry of Finance, which made the final decisions to accept or reject recommendations to negatively screen a company and to revoke existing exclusions. Norges Bank was then responsible for acting on the decision taken. From 2015 onwards, the Council on Ethics reports directly to Norges Bank, which then decides on accepting or rejecting the recommendation. The changes were implemented in the hope of increased coordination of exclusion and engagement initiatives. (Council on Ethics for the Government Pension Fund Global (2014)).

[12] Cumulative Abnormal Returns

the negative return impact is not reversed in the short term (in 6 to 12 days relative to the event). This is consistent with a demand driven effect or a revelation of bad fundamentals. Regression analysis shows that the return impact is stronger for more liquid firms. I then document divestment behaviour by ethics-sensitive investors for product exclusions, and coal-excluded firms in particular, which further strengthens the demand driven hypothesis. Preliminary analysis shows no effect on firm performance.

The returns analysis results could be a consequence of investors reacting to the announcement that the GPFG fund will not invest in a given firm rather than a reaction to the revelation of information about firm unethical behaviour. However, I find that firms for which an exclusion recommendation was published but where the final decision was not to exclude them have similar CARs to excluded firms. This suggests that the reactions are more likely to be driven by the ethics component of the announcement rather than the news that the Fund will no longer own shares in the firms.

Looking at mimicking behaviour by ethics-sensitive investors, I select two types of investors which are likely to be ethics-sensitive. The first is global pension funds, which are long term investors with a large base of beneficiaries and are considered to be constrained by social norms by Hong and Kacperczyk (2009). Overall, there is a reduction in the number of funds owning shares in product-excluded firms, which is more prolonged for coal-based exclusions. There is no reduction in ownership for conduct-based exclusions. Furthermore, I note significant regional variation in the reactions of pension funds. Both European and US funds react to the product-based exclusion recommendations, with fewer funds owning shares in the firms following the exclusions. However, since European pension funds have already sold out of some excluded firms, their reaction is more subdued than that of US pension funds. Reactions to the exclusions can be nuanced. In the case of Coal, fewer US pension funds hold shares in firms following their exclusion. In contrast, for tobacco, US funds show no reduction in the number of funds owning shares in the firms, but the exclusion announcements halt the previous trend of increasing number of US pension funds owning shares in tobacco firms. Therefore, in some cases the exclusion announcements lead to funds selling out of firms, while in others they act to dissuade funds which are not firm shareholders from becoming such.

The second type of potential ethics-sensitive investors analysed is US responsible mutual funds, classified as mutual funds with a social or ethics criterion.[13] The sample needs to be limited to US-registered mutual funds and US-listed firms due to availability of holdings data in the CRSP[14] database. The reactions of these mutual funds are similar to those of the pension funds, although the firms sample cannot be broken into too many categories due to the lower sample size. Fewer US

[13] using information from Thomson Reuters Eikon fund research platform

[14] Wharton Research Data Services Center for Research in Security Prices

Responsible mutual funds own shares in product-excluded firms following the exclusions. Conversely, they tend not to react to announcements of conduct violations. I also show that firms improve their ESG ratings following exclusions, which is driven by higher Environmental scores. In contrast, there is indicative evidence that governance ratings are decreasing.

Taken together, the results suggest that ethical investing has a negative impact on equity value which is not reversed in the short term. Observed divestment by ethics-sensitive investors of product exclusions supports a demand driven explanation.

The paper is linked to several strands of literature. One contribution is to expand on the literature of "sin" stock returns. Hong and Kacperczyk (2009) famously report higher returns for "sin" stocks relative to comparable stocks. However, for such "sin" stocks to achieve higher returns, they need to have become undervalued at a prior point. In this paper I examine one of the mechanisms via which this can occur, which is ethical exclusions. Therefore, the paper investigates whether ethical exclusions announcements have an impact on stock returns and, if so, in what manner. This is similar to papers which analyse firm returns around investor base expansions such as cross-listings in other territories (Foerster and Karolyi (1999)), except it analyses the opposite situation where the investor base is likely to contract rather than expand. Finding a demand-driven impact extends on prior evidence that firms have non-flat demand curves (Wurgler and Zhuravskaya (2002)). The paper is also unique in investigating clientele changes and investor overreaction in an ethical investing setting, while other papers have focused on clientele changes around corporate events such as stock splits (Dhar, Goetzmann and Zhu (2004)) and dividend policy (Pettit (1977)), as well as investor overreaction to recent stock returns (e.g. De Bondt and Thaler (1985).

The main contribution of the paper is to document a way in which firms perceived to be unethical can fall out of favour with some investors and lose equity value. It analyses the effect of corporate unethical behaviour on equity value by making use of a unique quasi-natural experimental setting provided by the GPFG's ethical exclusion announcements. It shows that there is an effect, and it is at least partially driven by the divestment of ethics-sensitive investors. The analysis is notable for identifying the mechanism through which unethical behaviour affects equity value. The paper also contributes to the literature on herd behaviour. This has been modelled in general by Banerjee (1992), Bikhchandani, Hirshleifer and Welch (1992) and in a investor setting by Barberis and Shleifer (2003). While Sias (2004) provide evidence of institutional investor herding, this paper documents mimicking behaviour by ethical institutional investors. Notably, Friedman and Heinle (2016) develop a model where firm CSR activities impact firm investor composition and vice versa. Investor reactions to negative CSR events have broadly been found to be adverse (for example, see Krüger (2015) and Becchetti, Ciciretti, Hasan and Kobeissi (2012)).

The rest of the paper is organized as follows. Section 2 details the hypotheses I analyse, and Section 3 reviews the relevant literature. Section 4 describes the data. The returns analysis is

presented in Section 5. Changes to firm ownership are reported in Section 6. Section 7 provides a brief analysis on possible customer reactions to the exclusions. Section 8 examines the evolution of firm ESG ratings following the announcements. Section 9 concludes and summarises the findings in the paper.

2 Hypotheses

I have three main hypotheses which could explain the impact of the GPFG's ethical exclusions on the firms it excludes. The first one is that the exclusions reduce the investor base of firms and cause a demand driven downward shock to returns. This is because remaining investors are forced to hold a higher proportion of firm shares than would be optimal in their portfolios and require a higher return for compensation. The reduced investor base could be as a result of investors selling out of firms due to ethical reasons and/or because the exclusions cause them to negatively revalue the strength of firm fundamentals and firm specific risk in a negative manner. In both cases there should be a an adverse return impact which is not reversed in the shirt run. If investors are correct to revalue firm fundamentals we should expect to also see firm performance changes in the future.

The second hypothesis is that investors overreact to the exclusion news, which are a negative piece of information. Overreacting investors then sell out of the excluded firms causing their prices to go down. However, later on they realise the exclusion news does not impact firm fundamentals and buy back the sold shares resulting in prices recovering. Therefore, the net impact is a short term dip in prices and no change in the clientele base.

The third and final hypothesis is that there is a switch in the investor base. Once ethics-sensitive investors become aware of the exclusions they sell out of firms. However, when prices go below those justified by firm fundamentals, ethics-insensitive investors step in and purchase firm shares, driving prices back up. As a result there is a short term negative return impact and longer term clientele change as ethics-sensitive investors are replaced by ethics-insensitive investors.

The observed changes in price, investor composition and firm performance should distinguish which mechanism is at play. The first hypothesis involves a non-transient drop in firm prices. In contrast, the second and third hypotheses involve transient price changes. The first hypotheses relies on divestment by some investors, while the third hypothesis implies a switch in the investor base.

3 Prior Literature

Our paper is an investigation of how ethical exclusions can impact firms. In particular, it examines how firms negatively screened out of the GPFG's portfolio for ethical reasons are im-

pacted in terms of returns, ownership structure, and ESG and financial performance. This sheds light on the mechanism via which ethical exclusions can impact firm value. In contrast, Aguilera, Bermejo, Capapé and Cuñat (2019) examine the mirror issue of how firms are affected by being owned by the GPFG fund. Specifically, they analyse the implications of a GPFG announcement in 2012 where the Fund introduced updated specific governance expectations for its portfolio firms. The authors document that portfolio firms improve their governance metrics in reaction to the announcement. This together with the fund tilting its portfolio towards higher governance firms increases the overall governance score of the GPFG. Notably, the majority of the fund's governance score improvement comes from the actions of portfolio firms to align with the fund's expectations.

The analysis of firm ethical behaviours in this paper is directly related by seminal work by Hong and Kacperczyk (2009) shows that "sin" stocks outperform comparable "non-sin" stocks.[15] A similar result is found by Kim and Venkatachalam (2011) and Fabozzi, Ma and Oliphant (2008). In contrast, Blitz and Fabozzi (2017) adjust sin stock returns for the Fama French 5 factors and discover that out-performance disappears. However, they do not benchmark firms against a matched samples, as in the case of Hong and Kacperczyk (2009).

For firms to have higher returns in the future, they should have become undervalued at some point in the past. A reduction in firm investor base seems a plausible candidate to have driven such a change in firm value. Indeed, Hong and Kacperczyk (2009) show lower institutional ownership levels for their sample of sin stocks. Theoretically, according to Merton (1987), a larger investor base is expected to reduce the cost of capital (returns) of firms and increase their value. This is consistent with empirical analysis by Foerster and Karolyi (1999), who find reduced long term returns of firms cross-listing their shares in the US. Similarly, Shleifer (1986) documents positive abnormal returns for stocks added to the S&P500 which is not reversed up to three months after the announcements.[16] By that logic, a reduced investor base will in contrast lead to lower firm value (short term) and higher cost of capital (long term). Similarly, Wurgler and Zhuravskaya (2002) argue that stocks have non-flat demand curves due to lack of perfect substitutes, which creates limits to arbitrage. Therefore, reduced shares demand following an ethical exclusion can reduce firm value due to non-flat demand curves and a lower investor base.

Directly related to ethical exclusions, Heinkel, Kraus and Zechner (2001) build a model where if a threshold is reached of a number of institutional investors divesting firms for acting unethically to the point that firm increased cost of capital is higher than the cost of reform, then firms would be induced to improve their practices. In such a framework, divestment is a tool to improve corporate ethical behaviour. It presents ethical exclusions as a dynamic process, the effectiveness of which

[15]The authors define "sin" firms as those belonging to the alcohol, tobacco and gaming industries.

[16]However, Patel and Welch (2017) argue that the return impact from additions and exclusions from the S&P500 index is no longer permanent.

may depend on the reaction of other investors to the announcement of exclusion, and not just the physical divestment of the announcing entity. On the other hand, Davies and Van Wesep (2018) build a model where divestment can be ineffective in changing firm behaviour as managers with large portions of their compensation based on stock options are likely to benefit from short run price reductions followed by longer term price increases.

In terms of investor behaviour, Roth Tran (2018) argues that philanthropic institutions have a monetary incentive to overinvest in firms which are run in a manner opposite to the institution's mission as this provides hedging benefits. For example, a charity providing support fort lung cancer patients would benefit from having more revenues when demand for tobacco products is high and correspondingly tobacco firm prices increase. Baker, Hollifield and Osambela (2019) expand on the idea and show that other factors may be counteracting the hedging benefits. In particular, they explore the possibility of environmentalist investors to coordinate in order to internalise the damages of pollution and for non pecuniary dis-utilities from owning shares in polluting stocks to affect the actions of investors.

For other investors to follow the Fund's exclusion behaviour, the information about firm unethical behaviour which they Fund brings to attention should be both credible and of importance to other investors. The Fund's exclusions under the different product criteria can be argued to bring no new information about general firm behaviour as investor would presumably be aware of which companies produce tobacco or coal outputs. However, they may serve to frame that behaviour as unethical. As a large institutional investor, the GPFG could be playing the role of a monitor of firm ethical behaviour for investors with limited resources which can be dedicated to monitoring. Models show that even in the presence of the free-rider problem, monitoring by large shareholders will occur (Admati, Pfleiderer and Zechner (1994)), although the level of monitoring can be sub-optimal (Shleifer and Vishny (1986)).

Prior work by Teoh, Welch and Wazzan (1999) investigates the consequences of the South African divestment campaign in the 1980s which was in response to the Apartheid regime in the country. The authors find no effect on the valuations of firms being listed on the South African stock markets or operating in the country.

Other research has documented that in the short term investors seem to react negatively to adverse CSR firm events (Krüger (2015)) and to deteriorations in CSR indicators such as firms leaving the Domini 400 Social Index (Becchetti, Ciciretti, Hasan and Kobeissi (2012)). Similarly, firms experience negative returns when they are found to have behaved irresponsibly with regard to the environment, and positive returns in the opposite case (Flammer (2013)). Firms experiencing chemical disasters also face a negative market reaction, especially those with bad prior records (Capelle-Blancard and Laguna (2010)). However, the papers do not examine the change in firm investor base around these events and the events.

In contrast, in this paper, I focus specifically on unethical behaviour and attempt to link the return impact to changes in the investor base around the exclusion announcements. Empirically, clientele changes have been documented in other settings such as around stock splits (Dhar, Goetzmann and Zhu (2004)) and negative returns for financially distressed stocks (Da and Gao (2010)). Additionally, while Modigliani and Miller (1958) state the irrelevance of firm capital structure in perfect markets where there are no transaction costs and taxes, they also recognise the potential existence of clientele effects if market imperfections exist (Miller and Modigliani (1961)). Pettit (1977) documents such dividend clientele effects among individual investors with varying ages and estimated different tax and capital gains rates. Closer to the ethics literature, Friedman and Heinle (2016) develop a model where firm investor composition and CSR activities are determined by investor CSR preferences.

A priori, one can also expect the reaction to the exclusion to be temporary and a result of investor overreaction to the exclusion news. De Bondt and Thaler (1985) document that monthly stock returns in CRSP are consistent with an investor overreaction hypothesis whereby investors "overreact" to stock recent returns history and portfolios of past "losers" outperform portfolios of past "winners". This implies that prices experience reversal in the longer term (up to three years). The impact is asymmetric with the "loser" portfolios experiencing much larger excess returns than "winner" portfolios. In a follow-up paper, De Bondt and Thaler (1987) find the results are robust to various factors such as the size effect and changes in risk as measured via CAPM betas. Using a sample of larger UK firms (from the FT 500 Index), Dissanaike (1997) also provides analysis in support of the investor overreaction hypothesis. Accordingly, the analysis in this paper investigates if the investor reaction is consistent with an overreaction hypothesis, whereby an initial negative reaction to the exclusion announcements is subsequently reversed without significant investor composition changes.

Additionally, the vast literature on CSR and long-term firm value touches on ethical behaviour issues. Empirically, Ferrell, Liang and Renneboog (2016) find a positive relationship between CSR and firm value. Similarly, Dhaliwal, Li, Tsang and Yang (2011) show that firms which rank favourably on CSR metrics compared to their peers benefit from a reduced cost of capital after starting to disclose CSR. Furthermore, such disclosures attract dedicated institutional investors as well as increased coverage by analysts. Similarly, El Ghoul, Guedhami, Kwok and Mishra (2011) find that firms with better CSR scores have lower costs of equity while firms in "sin" sectors, such as tobacco and nuclear, have higher cost of equity. Looking at the cost of debt, Goss and Roberts (2011) show that firms with CSR concerns are offered higher-spread bank loans (an economically modest but statistically significant effect). Along the same vein, Chava (2014) provides analysis that firms excluded by environmental screens face higher costs of capital and debt.

Aguilera, Bermejo, Capapé and Cuñat (2019) and this paper are not the only ones which ex-

amine the consequences of GPFG announcements. In particular, several studies have analysed the GPFG's ethical exclusions impact on firm returns previously. Dewenter, Han and Malatesta (2010) examine the effect of sovereign wealth fund investments as well as divestments on firm returns. While they separate out the GPFG's exclusions (19 cases), they do not focus on ethical exclusions per se or find significance for those exclusions. Similarly, Beck and Fidora (2008) analyse firm exclusions from the GPFG portfolio at the stock level and also find no statistically significant abnormal returns for divested stocks (20 cases). The overall results are that there is no return significance. However, both studies make use of a much smaller sample of exclusions than this paper (144 cases) as the Fund has significantly increased the number of exclusions in the last few years. Furthermore, they do not focus on uncovering the mechanism via which equity value would be impacted.

Examining the effect on home investors, Vasudeva (2013) demonstrates that the ethical exclusions increase the likelihood that the cross-border investments of focal Norwegian firms are in responsible firms (data prior to 2011). Similarly, Vasudeva, Nachum and Say (2018) find that during 1998–2011, Norwegian and Swedish firms acquire full equity ownership in firms domiciled in countries where the GPFG holds larger investments. In terms of consequences for the investor portfolio, focusing on GPFG and AP Fund exclusions, Hoepner and Schopohl (2016) show that the exclusions lead to the portfolio of the Fund having higher risk, while the same is not the case for exclusions by Sweden's AP Funds. Performance, on the other hand, is not affected.

Other papers have also investigated the effects of actions of a single institutional investor. For example, Smith (1996) examines shareholder activism by CalPERs and shows shareholder value increases for compliant firms. Similarly, Carleton, Nelson and Weisbach (1998) document the relatively successful engagements (more than 95%) with management by TIAA-CREF on corporate governance issues. Dimson, Karakaş and Li (2015) find positive abnormal returns following successful SRI-related activism by an unnamed large institutional investor. Furthermore, Hebb and Wójcik (2005) document emerging market countries strengthening regulatory standards in order to converge to global standards following exclusion from the portfolio of CalPERs due to low metrics.

4 Data and Summary Statistics

I collect in formation on the exclusions announcements from Norwegian Council on Ethics website, for all exclusions except coal exclusions, which are announced by Norges Bank Investment Management on their website. The exclusion announcements are reported via press releases as well as individual recommendations for companies and specific sectors depending on the type of exclusion. I consider the announcement date to be the date an exclusion is listed on either website. These are usually picked up by the media on the same day and on subsequent dates.

Table 1 Panel A shows the sample construction for the daily returns exclusion analysis. Although there were 150 firms which have been excluded in the analysis period, which goes up to end of May 2017, a number of cases were removed from the analysis, such as cases where there was no returns data available on Datastream. After cleaning the data, we are left with 144 events, 36 for conduct-based exclusions and 108 for product-based exclusions.

Firms returns data was collected from Datastream. Regional Global Fama French factors are used to benchmark firm returns. The results are presented relative to the Fama French 5 factors. All statistics are also calculated relative to the Fama French 3 factors as a robustness check and are almost identical. These are updated factors of those initially described in Fama and French (2012), and are calculated using data from 23 countries.[17] Stocks are sorted into four regions (North America, Europe, Japan, and Asia-Pacific exc. Japan).

Two datasets are used to analyse changes to the ownership structure of firms. First, Capital IQ provides data on institutional share holdings of firms. I use their dataset to identify pension fund ownership in the excluded firms. Second, CRSP has data of US-registered mutual fund holdings of US-listed firms. I use Thomson Reuter's Eikon to identify responsible mutual funds, defined as mutual funds with an ethical or social criterion. Then, I analyse their levels of ownership for the sample of the excluded firms which is available in CRSP. Finally, I employ MSCI ESG Intangible Value Assessment (IVA) Ratings data to document how excluded firms perform across ESG metrics following the announcements.

Table 1 shows summary statistics for the sample. The event distribution over time is shown in Panel C. The coal exclusions in April 2016 significantly increase the 2016 numbers, making up 44 of the 64 cases. The exclusion sample is global and comprises of a variety of countries, as displayed in Panel D. Although the United States is the single largest country by events, the most frequent region is the Asia-Pacific, with 50 events. The sample also represents numerous industries, shown in Panel E. Unsurprisingly, the most frequently represented industries tend to be those more likely to be excluded for unethical products, such as tobacco, coal, and defence. Table 2 summarises the main firm characteristics for the firms in the sample, where the data is available. It demonstrates that the firms display variety across the metrics displayed.

[17] Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, Great Britain, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Sweden, Singapore, United States

5 Impact of Exclusions on Firm Returns

5.1 Methodology

Cumulative Abnormal Returns (CARs) are used to detect if abnormal performance was present. CARs regressions are also used to supplement the analysis, where CARs are regressed on firm characteristics and relevant dummies.

Expected returns are calculated for an estimation window before the event which includes day -250 to -50 days versus the event as in Krüger (2015).[18] Following that, the model is forecast over the event window and abnormal returns are calculated as the difference between the expected and actual returns.

The market model factors used to estimate expected returns are the Daily North America, Asia-Pacific ex Japan, Europe, Global ex US, and Japan Fama French 3 and 5 factors (referred to as FF3 and FF5 factors). The results are presented for the FF5 factors, with the FF3 being used as a robustness check (not displayed). Standard abnormal returns statistics are used, which are described below. The formulas for abnormal returns are taken from Chapter 4 of Campbell, Lo, MacKinlay et al. (1997), Kolari and Pynnönen (2010) and Dewenter, Han and Malatesta (2010). $\overline{CAR}(\tau_1, \tau_2)$ is defined as the cumulative average abnormal return from τ_1 to τ_2 (event time dates).

The first metric used was Average CARs divided by standard deviation of average CARs (as in Dewenter, Han and Malatesta (2010)):

$$\frac{\overline{CAR}_(\tau_1, \tau_2)}{\sigma_{\overline{CAR}_(\tau_1, \tau_2)}} \tag{1}$$

The J_1 Statistic is also used (also described in Campbell, Lo, MacKinlay et al. (1997)):

$$J_1 = \frac{\overline{CAR}(\tau_1, \tau_2)}{[\widehat{\overline{\sigma}}^2(\tau_1, \tau_2)]^{1/2}} \overset{a}{\sim} \mathcal{N}(0,1) \tag{2}$$

The J_1 Statistic is also used (also described in Campbell, Lo, MacKinlay et al. (1997)):
where:

$$\widehat{\overline{\sigma}}^2(\tau_1, \tau_2) = \frac{1}{N^2} \sum_{i=1}^{N} \widehat{\sigma}_i^2(\tau_1, \tau_2) = \frac{\widehat{\sigma}_A^2(\tau_1, \tau_2)}{N} \tag{3}$$

where:

[18] A slightly smaller estimation window was employed for one company where the full window data was not available. Other estimation windows such as -250 to -30, achieve similar results. These are similar to the windows described in Aktas, de Bodt and Cousin (2007) and Edmans (2011)

$$\widehat{\sigma}_A^2(\tau_1,\tau_2) = \frac{1}{N}\sum_{i=1}^{N}\sigma_i^2(\tau_1,\tau_2) \tag{4}$$

Standardised CARs are also calculated (from Campbell, Lo, MacKinlay et al. (1997)):

$$\widehat{SCAR}_i(\tau_1,\tau_2) = \frac{\widehat{\overline{CAR_i}}(\tau_1,\tau_2)}{\widehat{\sigma}_i} \tag{5}$$

These are then averaged:

$$\overline{SCAR}(\tau_1,\tau_2) = \frac{1}{N}\sum_{i=1}^{N}\widehat{SCAR}(\tau_1,\tau_2) \tag{6}$$

which can be used in the J_2 (Campbell, Lo, MacKinlay et al. (1997)) and J_2^* , from Kolari and Pynnönen (2010)) statistics . The J_2^* is also called the modified Patell statistic.

$$J_2 = \left(\frac{N(L_1-4)}{L_1-2)}\right)^{1/2}\overline{SCAR}(\tau_1,\tau_2) \overset{a}{\sim} N(0,1) \tag{7}$$

$$J_2^* = \overline{SCAR}(\tau_1,\tau_2)\Bigg/\sqrt{\frac{L_1-2}{N(L_1-4)}(1+(N-1)\bar{r})} \tag{8}$$

The $\bar{r}$ being the average cross-sectional correlation coefficient of abnormal returns (model residuals) in the estimation period. N is the number of events, L_1 is the event estimation window. As the J_2 and J_2^* statistics formulas assume a single factor model, the calculations have been adjusted to use the correct subtractions for the three and five Fama French factors.

Z-score, used in Dewenter, Han and Malatesta (2010) is also calculated:

$$Zscore = \frac{\sum_{i=1}^{N} SCAR_i(\tau_1,\tau_2)}{\sqrt{N}} \tag{9}$$

Notably, while the majority of statistics assume cross-sectionally independent events, while the J_2^* accounts for cross-sectional correlation in order to correct for event clustering, which is present in the data.

The abnormal return statistics are used to investigate whether there is an effect on stock performance after the exclusion announcements, and if so, how the shape of the impact compares to the one anticipated by the different mechanisms described previously. As mentioned above, the announcement return impact not being reversed would be consistent with the demand-driven mechanism, while a reversal would be supportive of the overreaction and clientele change mechanisms.

The analysis uses the announcement date of the exclusions to measure when information about unethical behaviour is made public. The Fund sells shares prior to announcement. Therefore, at the point of physical divestment, other investors may observe increased number of shares being offered for sale but would not have information about the reasoning behind their disposal. On the other hand, on the exclusion announcement date, investors receive detailed information about unethical behaviour but have no expectation that the Fund will be selling shares in the future.

To investigate if there is anticipation of the exclusions prior to their announcement, raw and FF5-adjusted returns are plotted from the last 10 trading days before the event to 10 days after the event. Figure 2a shows raw returns, where there does not seem to be a strong pattern before or after the event. However, after adjusting raw returns for FF5 (the regional Fama French 5 Factors), Figure 2b shows a dip in abnormal returns from day -1 relative to the event. Therefore, to account for the possibility that news may have been anticipated prior to the announcements, abnormal returns are presented from day -1. Similar results are obtained if the day of the announcement date is used as a starting point.

5.2 Returns Analysis

The various exclusions abnormal returns metrics are showed in Table 3. The results are analysed over different horizons. -1 to 0 days relative to the event is used to examine the immediate impact of the exclusion announcements. A wider window, -1 to 5 days (seven days) is used to examine the returns impact up to five working days after the announcement. Following that period, the next seven working days are examined for a reversal in the returns impact. 5 days relative to the exclusions was chosen as the cut-off point as it represents the point at which abnormal negative returns peak (see Figure 3) so choosing the date should increase the chances of documenting a returns reversal. Crucially, the J_2^* accounts for event clustering, which the data suffers from.

In the total sample, the abnormal returns are statistically significant in both the short (-1 top 0) and longer horizons (-1 to 5 days). The impact of the exclusions is stronger in the longer period. A longer horizon is not analysed to avoid confounding firm events interfering with the event identification.

The main results are the following. After accounting for clustering, the post-exclusion period (6 to 12 days) does not experience a statistically significant reversal. In fact, there is no statistically significant reversal across any of the subsamples, when the clustering of the events is taken into consideration. If clustering is not accounted for there is a reversal, however, this is always of lower magnitude than the initial impact and its statistical significance tends to be at a lower level than is observed for the initial impact (5 and 10% rather than 1%).

In economic terms, looking at CARs, on average firms lose $30.6 million around the announce-

ment day (-0.94%, CARs -1 to 0 days) and $168[19] million of Market Capitalization by day five (-1.72%, CARs -1 to 5 days).

If the sample is split into product and conduct exclusions (Panels B and C), product exclusions have statistically significantly negative returns over the longer period (-1 to 5 days), while conduct exclusions are not significant in either the shorter or longer horizons. However, the conduct exclusions sample is relatively small (36 cases) which is likely to . Therefore, this result is further investigated in the regressions section.

In general, one reason why investors may place higher importance on product exclusions compared to conduct ones is that the product for which firms are excluded can be a major revenue source for firms and in consequence, product-based unethical behaviour may seem harder to alter than conduct-based one. At the same time, disposing of an unethical product would not be so onerous for a diversified firm. Therefore, the stronger reactions for product-excluded firms could incorporate investor beliefs that these firms are not diversified enough to have the capacity to change ethical behaviour.

Coal is by far the largest category of product exclusions (68) and also comprises almost half of the total sample (47%). Therefore, it is logical to wonder if coal exclusions may be driving the short term return impact. Panels D and E display the results for abnormal returns when only coal exclusions are analysed and when the rest of sample is examined. Coal exclusions have a statistical negative return impact in the larger horizon -1 to 5 days), but not in the shorter horizon -1 to 0 days), while the opposite is true for the rest of the sample. Therefore, while investors seem to react to both types of exclusions, there may be a difference in the manner of the reactions. This is investigated further in the ownership section of the paper.

Splitting exclusions by region (Panels F to H), the results are strongest for North American firms, while they are insignificant for exclusions from the Asia-Pacific region. This is also the case for and European exclusions where the sample is relatively small (20) limiting the power of the test.

Taken together, the results suggest that ethical exclusion cause companies to become out of favour with investors.

5.3 Regression Analysis

This section investigates which factors affect the level of CARs in a regression setting. I employ this method of analysis in order to look at the impact of exclusions on firm value while controlling for firm characteristics and other relevant variables.

[19]CAR are converted into dollar amounts for each firm and then averaged for the sample to calculate the number.

Factors similar to those in Hong and Kacperczyk (2009), who analyse the performance of "sin" stocks, are also included. Such firm characteristic data is available for 135 of the 144 companies in the main sample. These include the log size of firms (market capitalisation, $M), log Market-to-Book (MtB) ratio, average past returns, stock turnover (in as a percentage of free float shares), and firm age. Firm size and MtB are taken from the -3 day versus the event. Turnover is the average share turnover over days -14 to -3 relative to the event divided by the number of free float shares of the firm at day -3 (times 100). Average past return is the average return in the 5 previous working days. Firm age is taken as the year when company accounts are first available (from Datastream) versus the event date. The dependent variables are CARs relative to the FF5 factors. Errors are clustered at the exclusion announcement date.

Additionally, dummies are included for the region of the firm and for the exclusion being conduct-based (36 cases).[20] Table 5 shows summary statistics for the independent variables. The base equation is:

$$CAR_t = C + D_{Conduct} + Log(size)_{t-3} + Log(M/B)_{t-3} + \bar{r}_{t-14,t-3} + \overline{TurnoverPerc}_{t-14,t-3} + Log(age)_{t-3} + D_{Asia-Pacific} + D_{NorthAmerica} + D_{Europe} + \varepsilon_t$$

The market is not included as a factor since the abnormal returns are relative to the Regional Fama French Factors, which already include a market factor. Therefore, market exposure on firm returns is contained in the fitted returns component which is removed from realised returns to calculate abnormal returns. Consequently, the abnormal returns component should not contain any market exposure.

Table 6 displays the results of the regressions, which are run for the strongest commutative abnormal returns, from day -1 to day 5 relative to the announcement date. After accounting for firm characteristics, firms excluded for unethical conduct have similar CARs to those negatively screened for product violations. Therefore, while when splitting the two samples it seems that investors react less strongly to conduct exclusions, one cannot conclude that there is no reaction to them.

In the next column, a dummy for coal-related exclusions is instead included in the base regressions, to check if coal-exclusions have stronger return impact once firm characteristics are accounted for. The dummy is also not significant. Therefore, again I cannot conclude that coal exclusions in particular cause a stronger return reaction than non-coal negative screenings as the

[20]Industry fixed effects were not included as the distribution has a long tail (see Table 1, Panel E) so including dummies would largely exclude firms in the smallest categories from the calculations by attributing their CARs in the dummy variable. The larger categories, on the other hand, largely overlap with product-based exclusions and would cloud that analysis.

difference could be due to firm characteristics.

Looking at European firm, they have lower (absolute) abnormal returns than other exclusions. In contrast, older firms and more liquid firms (proxied via higher turnover as a percentage of free float) have stronger abnormal returns. Surprisingly, North American firms do not have statistically significantly different returns from total exclusions, while their subsample results were more pronounced than the total (Table 3 Panel G). It seems that this could have been driven by liquidity as North American firms have almost twice the turnover of the next most liquid region (see Table 7). In fact, average CARs tend to become less negative (and positive) with lower firm turnover. This trend is true for all regions but the last one, which is a grouping of eight firms headquartered in either Africa, Central or South America. Therefore, liquidity is emerging as an important factor associated with the potential negative impact of exclusions.

Results in columns 3 and 4 are discussed in the Robustness checks sections. Finally, a dummy was included in the base specifications to test for the change in the final decision-maker for exclusions from the Norwegian Ministry of Finance to Norges Bank (not reported). The dummy was not significant, suggesting that the market does not distinguish between the two.

5.4 Robustness Checks

Abnormal returns were also analysed for the sub-sample of firms which were re-included in the Fund's investment universe, following an improvement in their conduct or a termination of the production of an excluded category (eleven cases, see Table 4). The announcement date of the revocation of the exclusion is used as the event date. The abnormal returns metrics were insignificant across both the short (-1 to 0 days) and longer (-1 to 5 days) horizons. If anything, there seems to be a statistically significant negative return reaction in the subsequent period (-6 to 12 days). However, both the lack of reaction in the main event window and the small sample size cast doubt on the validity of that finding. Nevertheless, overall, there is indicative evidence that investors do not react positively to news that firms have changed their behaviour and are re-included into the Fund's investment universe.

To investigate the possibility that firms for which the exclusion was later revoked were different from other excluded firms to begin with, a dummy is included in the base CAR regressions (displayed in column 3 of table ,Table 6) to indicate if a firm was later re-included into the universe of the Fund's portfolio. The dummy is insignificant, suggesting that the later re-included firms were not different from the rest of the excluded firms at exclusion.

Another argument against the validity of the results could be that the abnormal returns are a reaction to the information that firms are being excluded from the investment universe of the Fund

rather than a reaction to the news that the exclusion is for ethical reasons. I show evidence against this hypothesis in the fourth column of Table 6. This column displays CARs regressions which include "non-excluded" firms. These are cases where the Fund published an exclusion recommendation which was not followed and the firms were not excluded from the Fund's investment universe (ten cases). For the non-excluded firms, the event date is the announcement data of the decision not to exclude, which is usually accompanied with a detailed report of a recommendation to exclude the firms, similarly to those which are approved. The overall dummy a recommendation not being followed is insignificant, indicating that abnormal returns of such cases are the same as those of normal exclusions. Graphically, in Figure 4, CARs for Exclusions and Non-exclusions show that non-exclusions have similar abnormal returns, although as can be expected due to the lower sample size, non-exclusions are more volatile.

On 16^{th} November 2017, NBIM[21] proposed dropping Oil and Gas stocks from the portfolio benchmark for diversification purposes. It received considerable media attention. While the exclusion proposal was made for non-ethical reasons, fossil fuels have faced pressure from ethical investors, and the Fund has a coal ethical exclusion criterion in place. I analyse the reaction using event study methodology. Returns of the stocks in Thomson Reuters' Global Oil and Gas index are tested for an effect around the announcement.[22] Returns are benchmarked relative to the Global Fama French 5 factors. Since this is a one-off event and all 290 firms are clustered at the same date, it is imperative to look at the J_2^* statistic for significance inferences. The statistic is not significant in either the main or subsequent period.

Overall, the lack of significance lends support to the hypothesis that announcements of ethical exclusions may have a stronger impact than those negatively screened for diversification purposes. However, the Oil & Gas sector has not yet been excluded and I have not yet analysed subsequent announcements with regards to the exclusion proposal. Furthermore, there may have been mixed messages in the media as to whether the exclusion would be made for ethical or diversification reasons[23]. Therefore, cautious interpretation is in order, since this result is based on a single announcement on one date. Ideally, further announcements of this or similar exclusions for non-ethical reasons would be analysed in order to form more robust inferences.

6 Ownership Analysis

Having observed that ethical exclusion reduce firm value, this section investigates if a reduced owner base is responsible for the effect. To achieve this, I examine ownership by investors whom

[21] Norges Bank Investment Management, the managers of the GPFG

[22] where returns are available, for 289 out of 294 cases

[23] See https://tinyurl.com/reuters-1, https://tinyurl.com/guardian-1

are likely to be ethics-sensitive - global pension funds and responsible mutual funds.

Looking at the Capital IQ ownership data, Table 9 shows "# Firms Available" which for each event time quarter shows the maximum number of excluded firms (out of the total sample of 144) which could have been owned by investors. This provides information on sample consistency over time and shows that the sample size was fairly stable for Quarters -6 to 4. Inferences outside of this window using Capital IQ data would not be representative of the full sample, so they are not attempted when other investor holdings are analysed.

6.1 Changes to firm ownership by global pension funds

Pension funds, in general, are likely to have a longer run outlook when investing and can potentially be an investor group which sympathises with the ethical concerns of the Fund. Notably, Hong and Kacperczyk (2009) include pension funds in their list of "norm-constrained" investors, which they define to include "institutions whose positions in stocks are public information, institutions with diverse constituents, and institutions that can be readily exposed to public scrutiny (e.g., picketing by an unhappy minority)".

Therefore, in this section, I employ the Capital IQ dataset, with ownership data to end March 2018, to investigate global pension fund reactions to the GPFG exclusions announcements. Each table shows the mean number of pension funds owning shares in excluded firms in the quarter before exclusion is announced (Q-1), which is compared to the number of pension funds owning shares in Quarters -4 before exclusion to Quarter 4 following the announcements. Quarter 0 is the announcement quarter.

The reference quarter is always Quarter -1. For that quarter I calculate the average number of funds owning shares in the excluded firms. For example, if we had only two excluded firms, Firm A and Firm B and Firm A was owned by 10 pension funds in Q-1 while Firm B was owned by 8 pension funds in Q-1, then number for the "Funds Q-1" column would be the average of the two numbers, which is 9. Intuitively, the average for Q-1 should be the same in each comparison. However, as we move forwards in event time firms get re-included in the Fund universe and some firms do not have data as the event quarter is past the database end quarter. This is recorded in the "Funds Sample" column. For those quarters the average for Q-1 and the comparison quarter is calculated using only the firms available in both quarters. One firms gets excluded from the sample in Q2 and then three more in Q4. After that point more firms start dropping off from the sample making it less representative so I do not report results past Q4. For the full exclusion sample, this column is equivalent to the "# Firms Available" column in Table 9 where I show the firms the GPFG has excluded for which there is data in each quarter.

The "Funds Q#" column reports the average fund ownership per firm in the relevant comparison

quarter. For each row the quarter is listed in the first column (Quarter # Before or After). So continuing the previous example, if in Quarter 2, Firm A is owned by 6 funds and Firm B by 4 funds, the average fund ownership would be 5, which would be recorded in the "Funds Q#" column in the row corresponding to comparison Quarter 2. The "Difference" quarter presents the difference between the two ownership levels, subtracting average ownership in the reference Quarter -1 from the relevant comparison quarter in each row. The number is negative if the comparison quarter has lower ownership than the reference quarter. Finally, the "Funds Sample" column records how many pension funds owned shares in at least one firm in the reference or comparison quarters. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different.[24]

Table 10 shows the main results.[25] In Panel A we see ownership changes for the full sample. Average fund ownership of excluded firms falls following the exclusion announcements. Ownership is also lower compared to Quarter -1 for Quarters 0 to 3, but it is only statistically significantly lower for Quarter 0. However, this decrease is not long-lasting, and is reversed by Quarter 3. Furthermore, ownership was not stable in prior quarters. The mixed overall picture is driven by the variation in responses by pension funds in the different geographies, which is explored further later in this section. The total results are similar to those for product exclusions, shown in Panel B. Conduct negative screenings, shown in Panel C, are associated with no statistically significant changes in pension fund ownership.

Exclusions under the coal criterion are the largest sub-category. These are analysed in Panel D. Pension fund ownership in Quarters 0 to 4 is lower than that in Quarter -1, and this is statistically significant for Quarters 0 to 3. Therefore, pension funds seem to decrease ownership of coal-excluded firms in a more prolonged manner than other exclusions. Graphically, the story is more complex. Looking at Figure 5a, which is the chart for coal exclusions, it seems that the reduction of coal ownership is part of a continuing trend. This seems to be the case due to selling European pension funds, which I will explore further in the regional analysis part of this section.

In contrast, looking at all exclusions except those under the coal criterion, in Panel E, pension funds seem to generally be increasing ownership of the excluded firms prior to announcements. They serve to pause this trend for the quarter of the announcement and the next quarter, but the pattern resumes afterwards.

This is also the case for Tobacco-excluded firms who were also experiencing increasing ownership by pension funds prior to the exclusion announcements, which is partially halted following

[24] equivalent to testing if the difference in ownership is statistically significantly different from zero

[25] In results which are not reported, the firm sample to companies which were owned by at least one pension fund in the quarter before announcement. The results for this restricted sample are slightly stronger, but this is due to not considering the case where a firm may have had no ownership by pension funds prior to the exclusion announcement and had pension funds purchase shares in it during later quarters.

the announcements. This is shown in Panel F and Figure 5b. Quarters -4 to -2 all have statistically significantly lower pension fund ownership than Quarter 2, indicating a steady increase in ownership. Conversely, following the exclusion announcements, the latter quarters are not statistically significantly different from Quarter -1. The impact for tobacco-excluded firms is driven by US pension fund (in)activity.

It is plausible that pension funds which are geographically closer to Norway may have more aligned ethical concerns to those of the GPFG. Consequently, I split the pension fund sample into regions and check if European, USA, and Asia-Pacific funds have different reactions to the exclusion announcements. The results for European pension funds are displayed in Table 11, while those for US Pension funds are in Table 12. Pension funds in Asia Pacific owned on average less than one excluded firm so these were not examined separately.

For the total sample of exclusions, European funds decrease ownership following the announcements. This is statistically significant for Quarters 0 and 2. However, we can see graphically that their ownership of the excluded firms has also been slowly decreasing over time prior to the announcements (Figure 6). on the other hand, US and Asia-Pacific pension funds show no reactions in the quarter of the exclusions. There is a reduction in ownership for US funds in Quarter 1.

The reduction in holdings for product firms is similar to that for the total exclusion sample in the case of European pension funds. US pension funds, on the other hand, reduce ownership of product-excluded firms in the quarters following the announcements, which is statistically significant for the quarter of the exclusion. Furthermore, overall they experience less fluctuation in ownership in the quarters prior to the exclusion, suggesting they were less prone to selling behaviour prior to the announcements, unlike the European pension funds. Neither European nor United States pension funds react to conduct exclusions.

For Coal exclusions, both European and US pension funds reduce ownership in the exclusion announcement quarter. However, European Funds have reduced ownership in quarters prior to the exclusion (Quarters - 4 and - 3, also graphically in Figure 6a), and do not have statistically significantly lower ownership in the quarters following the exclusions. In contrast, US pension funds do not change ownership in the quarters prior to the exclusion announcements, but do have lower ownership in the exclusion quarter and the four quarters following it, although this is only statistically significant up to quarter 3. Therefore, it seems that European Funds were already significantly reducing ownership in coal firms when the Fund made its exclusion recommendation, and thus their subsequent reaction was more subdued. US pension funds, on the other hand, had not made such changes and had a stronger and longer lasting reaction to the GPFG's announcements. Looking at all exclusions except for coal, European Pension and US pension funds react similarly to the total pension funds sample.

Tobacco exclusions have lower ownership by European Funds following the exclusion an-

nouncements, but this is only statistically significant in the event quarter. An increasing number of US pension funds, on the other hand, were owning shares in tobacco firms over time prior to the exclusions, a trend which was no longer statistically significant following the exclusions. Therefore, the fund announcements seems to have dissuaded current non-investing US pension funds from buying tobacco shares, while not changing the minds of existing US pension fund owners.

Overall, there is significant regional variation in the reactions of pension funds to the exclusion recommendations. Among European and US pension funds, it seems that the GPFG influences US funds more. Both categories react to product exclusions. However, European funds have already been selling out of coal firms by the time the GPFG officially recommends excluding them. As a result, their reaction to the exclusion recommendation is part of a pre-existing pattern of declining ownership. Their reaction to tobacco exclusions is also subdued. US pension funds, on the other hand, have not been selling out of coal firms significantly and start doing so in the quarter of the exclusion announcements. They then continue having lower ownership levels in the subsequent quarters. Similarly, for tobacco exclusions, the GPFG's exclusion announcements put a stop to an existing trend of increasing ownership of tobacco firms by US pension funds.

Taken together, the results suggest that investors likely to have very similar ethics beliefs to those of the GPFG may have already incorporated these into their portfolios. Therefore, the Fund may have more scope for affecting the behaviour of investors whose existing ethics beliefs are similar to its own but not too close, such as US pension funds.

6.2 Changes to firm ownership by responsible US mutual funds

Another category of ethics-sensitive investors are mutual funds with explicit mandates to consider non-financial metrics. These are identified using Thomson Reuters' Fund Screener (via Eikon). The universe of mutual funds consists of US-registered mutual funds with Ethical or Social screens, which also have a cusip number which matches the WRDs CRSP database. The data goes as far as end November 2017, so the last quarter I can analyse is end September 2017. The number of funds analysed is 177 (see Table 13 Panel A). Since the overlap between fund with Ethical or Social screens is very large (176 out of 177), the analysis is performed for the total number of responsible funds identified. Holdings are analysed at the quarterly event time level. The procedure is as follows. If a fund has reported holdings in the event time quarter for a firm, the holdings will be set to (1) the values reported for the firm, (2) 0 if no holdings for the firm are reported in the particular quarter, or (3) to missing if the firm's exclusion has been revoked. Data for quarters in which the fund has not reported holdings are also set to missing. Responsible index funds were excluded from the analysis (20) [26] since they do not make active decisions on which

[26] Funds having Index, Indx or Idx in their name

firms to own.

The total number of excluded firms which were matched to firms in the CRSP database is 60 (out 144, Table 13 Panel B). Of these, 57 were at some point owned by a responsible fund in the database. A breakdown of the total firm sample and the matched firms in CRSP by various categories is presented in Table 1. Panel B shows that of the 36 conduct exclusions, 13 were identified in CRSP, while of the 108 product exclusions, 47 were matched to the database. Panel C displays the distribution of matched exclusions by year. The low matching rate is caused by the nature of the database which only covers US-listed firms. Therefore, the majority of matched firms are head-quartered in the United States, (see Panel D). Of the 60 matched firms, 45 are from the United States, and only 15 have headquarters elsewhere. The overlap is not complete as some firms are head-quartered outside the United States but are listed on a US Stock Exchange. Finally, Panel E presents the industry breakdown of exclusions.

Similarly to the pension funds analysis, I examine how many responsible funds report owning shares of the excluded companies before and after exclusion. The comparison is done for the quarter before exclusion is announced (Quarter -1) relative to the quarters following the announcements. Quarter 0 is the quarter which includes the exclusion announcement, Quarter 1 is be the first quarter following the exclusion announcement, Quarter -1 is one quarter prior to the exclusion, and so forth. The analysis is limited to Quarter 4 after the event as the sample size drops significantly after that. The results are presented in Table 13.[27] Panel A compares average fund ownership by all firms matched to the CRSP holdings data. Panel B restricts results to product-excluded firms and Panel C to conduct-excluded firms.

The format and interpretations of the tables is the same as for the pension funds analysis, with one exception. Since in CRSP some mutual funds do not consistently report holdings in each quarter, I need to keep track of which mutual funds have reported data in both the reference and comparison quarters and only analyse holdings where I have mutual funds reporting in both. Therefore, even for quarters where the firms sample is the same, the average ownership levels for the reference quarter will vary depending on over how many mutual funds it is calculated.

For example, if for Firm A in Q-1 10 mutual funds report holdings data, in Quarter 2 only 8 of them report data, while in Q3 9 report holdings, then the reference and comparisons ownership levels for Q-1 compared to Q2 will be calculated using holdings data for the 8 mutual funds, while the averages for Q-1 versus Q3 will use ownership data for the 9 mutual funds. This can then result in different average ownership levels for Q-1 if one the fund which did not report holdings in Q2 but reported holdings in Q3 had positive share ownership in Firm A in Q-1.

Looking at ownership by all responsible funds in Panel A, ownership does not seem to change

[27] In unreported results the sample is restricted to firms owned by responsible funds prior to exclusion. The results are slightly stronger but with the same implications as the ones presented in the main part of the paper here.

in the quarters prior to exclusion and declines in the quarters following the exclusion. However, this change is no longer statistically significant after the exclusion quarter. Similarly to the abnormal returns and the pension fund ownership analysis, the results are more pronounced for product exclusions (Panel B), where quarters 2 and 3 after the exclusion also have statistically significantly lower ownership. Unfortunately, as the sample size of excluded firms is already small, it cannot be broken down further into the different product exclusion categories. Conduct exclusions show no statistically significant change in ownership. While the overall level of ownership by responsible funds is low, at just over one fund on average owning an excluded firm, these funds are different for the various firms and the results are not driven by just one or two responsible funds.

In summary, fewer US-domiciled responsible funds own shares in product-excluded firms following the exclusion announcements, but the funds do not react to conduct-based exclusions. Therefore, there is evidence that US responsible mutual funds follow some of the GPFG's exclusion recommendations.

7 Potential Customer Reactions

Since the exclusion announcements are not based on any financial information about the excluded firms, the expectation would be that firm performance metrics would not be affected by them. On the other hand, firm customers could react adversely to the announcements. This section aims to determine if there are any indications of such negative consequences. Specifically, changes in Receivables to 5 Year Average Assets were used to test for potential negative customer reactions. The metric is likely to increase if customers postpone paying bills to excluded firms. Furthermore, Net Sales to Lag 1 of Assets is used to check is customers decide to purchase fewer goods from the excluded firms.

The performance metrics are disclosed annually and consequently the granularity of the data is not large. The results are displayed in Table 14. The sample size is representative of the total when looking up to one year following the exclusion and drops significantly afterwards. Nevertheless, results confirm the base hypothesis that the metrics does not deteriorate following the announcements. There are no statistically significant changes for receivables, shown in Panel A. Net Sales also do not change in the event year or the year after it. Curiously, they do increase for conduct exclusions two years after the exclusion events, but given the lack of change in the previous years it is unlikely that the exclusion announcements are the cause of this. Therefore, it seems that firm customers do not react negatively to the exclusions.

8 Changes to Excluded Firm ESG Performance

In this section, I examine firm performance on Environmental, Social and Governance (ESG) dimensions in event time. The aim is to determine if firms change their ESG scores following the exclusions. I use the MSCI's ESG Intangible Value Assessment (IVA) Ratings[28] data from 2007 to October 2018. MSCI Research combines over 35 key issue metrics for each company into a composite score (Weighted-Average Key Issue Score). This is then industry-adjusted to generate a score comparable across companies with different lines of business (Final Industry-Adjusted Company Score). This score is translated into an ESG rating score ranging from A to CCC. For the purpose of this analysis, I examine the numerical scores. These range from 0 to 10, with 0 being the worst possible score on the given metric and 10 representing a top score.[29] I start by looking at the industry adjusted and raw weighted ESG score. I also look at the Environmental, Social and Governance key pillar scores into which the individual theme scores can be collated. The results are shown in Table 15.

For each score we use a paired t-test to compare firm values in Month -1 relative to the exclusion announcement month in event time to their values in five other event time months (0, 3, 6, 12, and 18), displayed in each row. Panel A displays the results for the total sample, while Panels B and C show the results for product and conduct exclusions respectively. The matched firms sample (maximum 69) is lower than the total exclusions (144) for several reasons. First, our exclusions sample starts in 2005 while the MSCI data starts in 2007. Second, not all firms are covered in the database. Third, firms start to drop out as we move forwards n event time if the exclusion is recent. Finally, firms which are re-included are also excluded from the comparison once they have been re-included.

Nevertheless, I still find significant changes to the ESG metrics following the exclusions. For the total sample (Panel A), firms have statistically significantly higher their industry-adjusted company scores starting from a quarter following the announcements. This improvement is long-lasting and is still significant in 18 months (event) time. In contrast, the unadjusted raw ESG score, (weighted-average key issues score), remains unchanged up to half a year following the announcements. However, it also records an improvement in the long term (12-18 months). This seems to be driven by higher Environmental Pillar scores. Conversely, the Social and Governance pillar scores do not change significantly. In absolute terms, there is minimal alterations to the Social pillar score and the Governance pillar score deteriorates.

The results for product exclusions are similar to those of the total sample (Panel B). However,

[28] described at https://www.msci.com/documents/10199/123a2b2b-1395-4aa2-a121-ea14de6d708a, accessed September 2019

[29] This is in contrast to some "risk exposure" metrics in the data where 0 is the lowest possible exposure and 10 the highest

there is a stronger change in the Social Pillar score, which is significant at the six months horizon. Similarly. the deterioration of the Governance Pillar score is significant at the six and eighteen month horizons. The conduct exclusion sample (Panel C) s relatively small, with a maximum of 16 excluded firms being matched across the metrics. Therefore, the only significant change is a higher industry-adjusted score six months following the announcements.

Since the results for the main sample appear to be driven by changes in the Environmental pillar metrics, next I analyse the four themes which the score is comprised of. These are "Climate Change", "Natural Capital", "Pollution & Waste" and "Environmental Opportunities". The results are displayed in Table 16. Over the longer term (a year and a half), three out of the four themes are higher relative to their pre-exclusion levels. The climate change score records the highest rise, which starts being statistically significant at 12 months. Product exclusion results (Panel B) mirror those for the main sample. Conduct exclusions (Panel C) have a sample below 10 which contributes to their changes not being statistically significant.

Therefore, I document that firms increase their overall ESG scores following exclusions, especially after adjusting it for firm industry affiliation. In particular, over the longer term, environmental metrics are improved over the majority of themes tracked by MSCI. In contrast, there is no change to social metrics and there are indicative results that firm governance may be deteriorating.

9 Summary and Conclusions

This paper analysed the consequences of corporate unethical behaviour by examining changes to firm equity value and ownership structure as a result of the GPFG's ethical exclusion announcements. It documents a negative return impact around the announcements, which is not reversed in the short term. Some ethics-sensitive investors also mimic the behaviour of the GPFG and divest product-excluded firms, in particular those under the coal criterion. Taken together, the results support a demand driven mechanism where firm prices are pushed down by a reduced investor base. Therefore, the paper documents one of the ways in which firms perceived to be unethical can fall out of favour with ethics sensitive investors and lose equity value. In conclusion, it seems that ethical divesting has an impact on equity value and at least part of this is due to ethics-sensitive investors selling firm shares in product-based exclusions. Furthermore, the adverse impact of exclusions is stronger for more liquid firms. In addition, I document that firms seem to improve their overall ESG scores following the exclusions, which is driven by higher Environmental ratings. In contrast, firm governance may be decreasing, especially for product-excluded firms.

The paper suffers from some drawbacks. While the sample of excluded firms is global, the returns analysis is based on US Dollar prices, so the results are from the perspective of a US investor. Moreover, firm ownership data is only available at the quarterly level. This means that

only longer-term ownership changes can be analysed as investors who have purchased and sold shares (or the opposite) within a given quarter, leaving their quarterly holdings unaffected, are not visible in the data.

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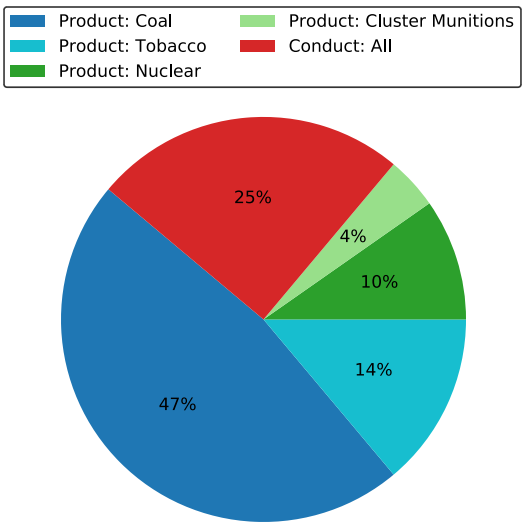
10 Figures

Figure 1: **Overview of Data**

(a) **Exclusions by type**

This Figure displays how the GPFG's exclusions are split by the type of exclusion. Product exclusions are also split by their sub-category.



(b) **Regional composition of exclusions**

This Figure displays how the GPFG's exclusions are split by the geography of exclusions, measured by the location of the headquarters of the excluded firms.

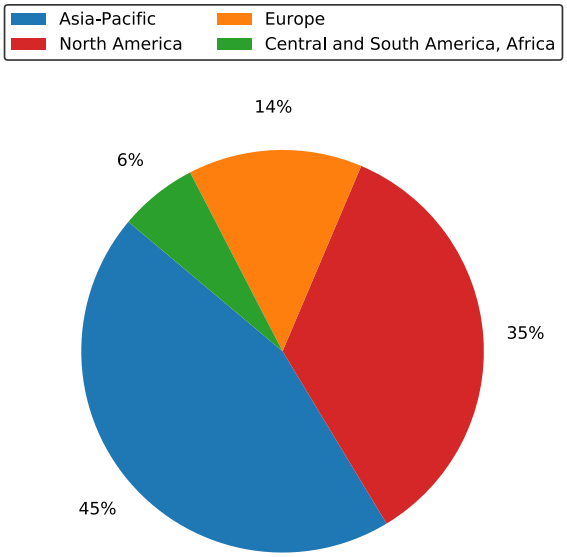
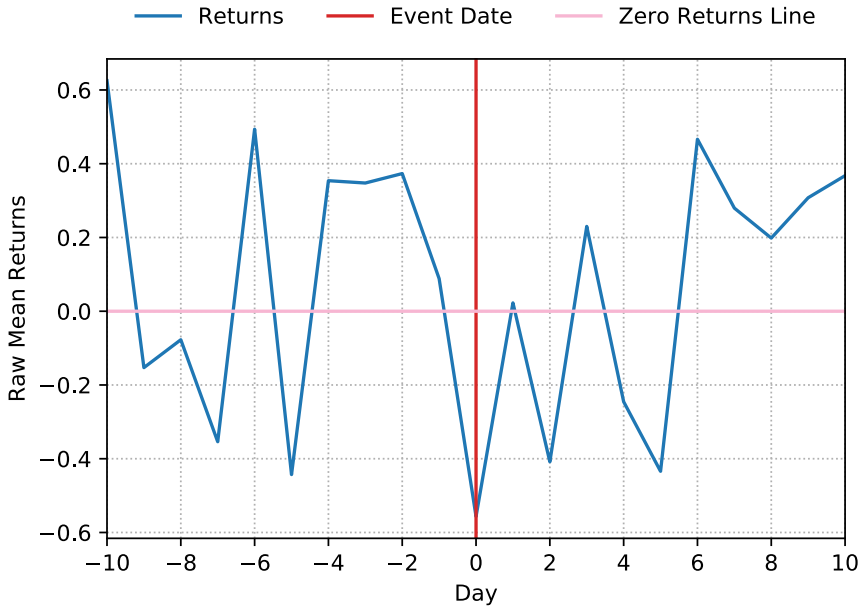


Figure 2: **Information Anticipation Charts**

(a) **All Exclusions, mean raw returns**, around exclusion announcement time

This Figure plots the average raw returns for a GPFG excluded firm around the exclusion announcement date.



(b) **All Exclusions, mean FF5-adjusted returns**, around exclusion announcement time

This Figure plots the average abnormal returns for a GPFG excluded firm around the exclusion announcement date. Abnormal returns are calculated versus the Global Fama French 5 factors.

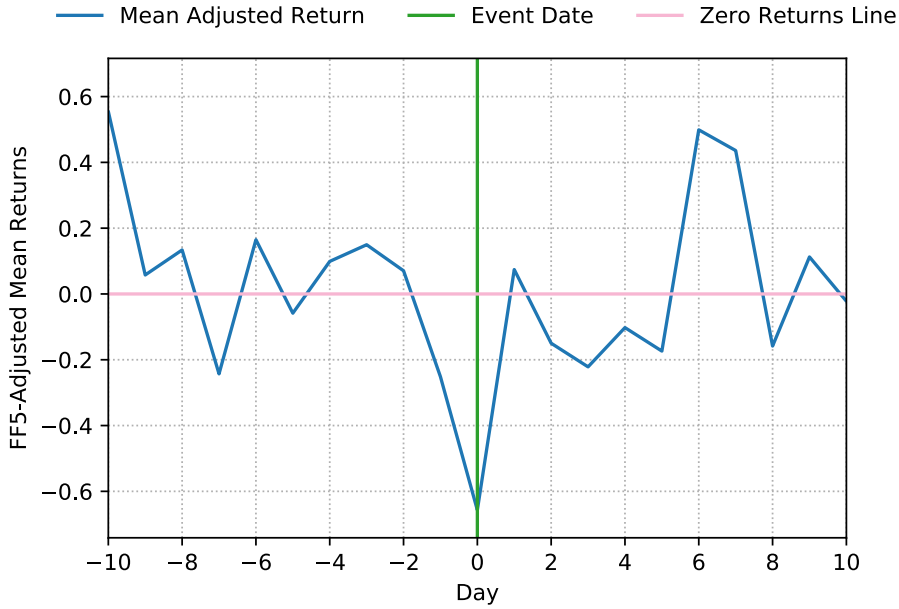
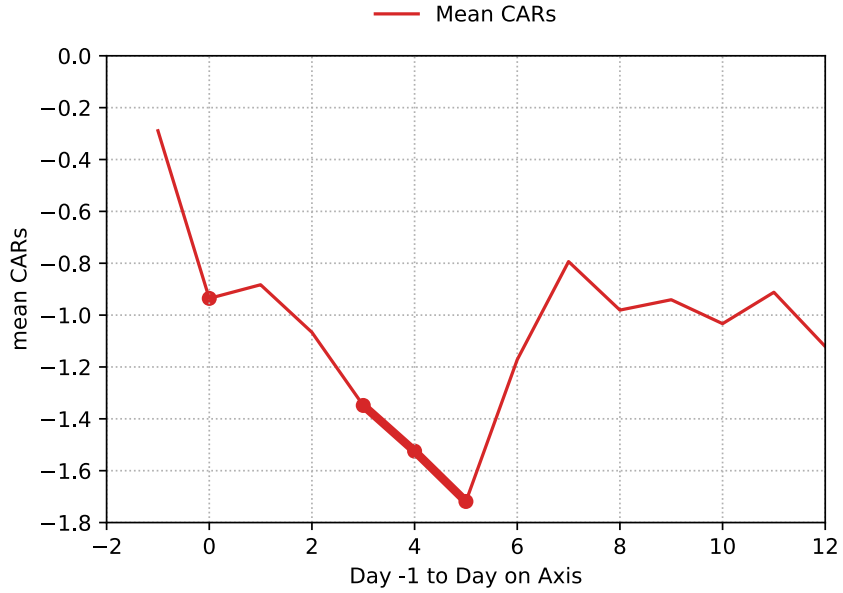


Figure 3: **Exclusions Mean CARs relative to FF5 Factors**, thick line if J_2^*s significant at 10%

The Plots graph the mean cumulative abnormal returns (CARs) for a GPFG excluded firm around the exclusion announcement date. Abnormal returns are calculated versus the Global Fama French 5 factors, and are cumulated from Day -1 in event time.

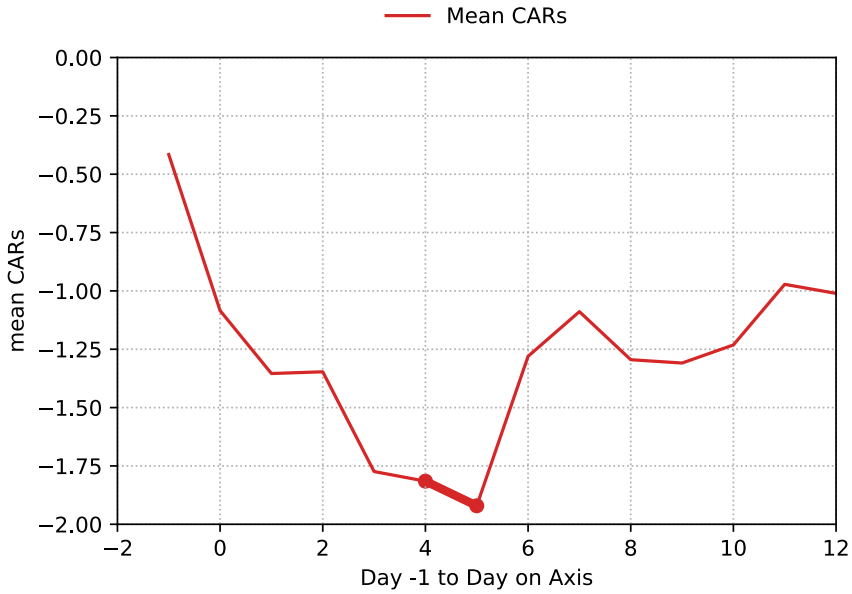
(a) All Exclusions

Mean CARs for all excluded firms



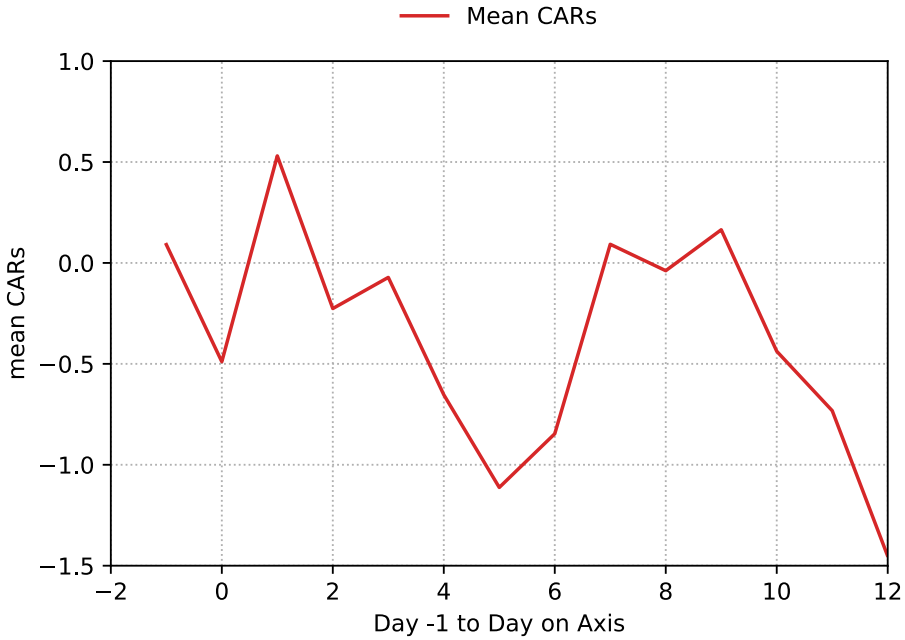
(b) Product Exclusions

Mean CARs for firms excluded under the product criterion



(c) Conduct Exclusions

Mean CARs for firms excluded under the conduct criterion



(d) Reinclusions

Mean CARs for excluded firms whose exclusion is later revoked. CARs calculated around the reinclusion announcements.

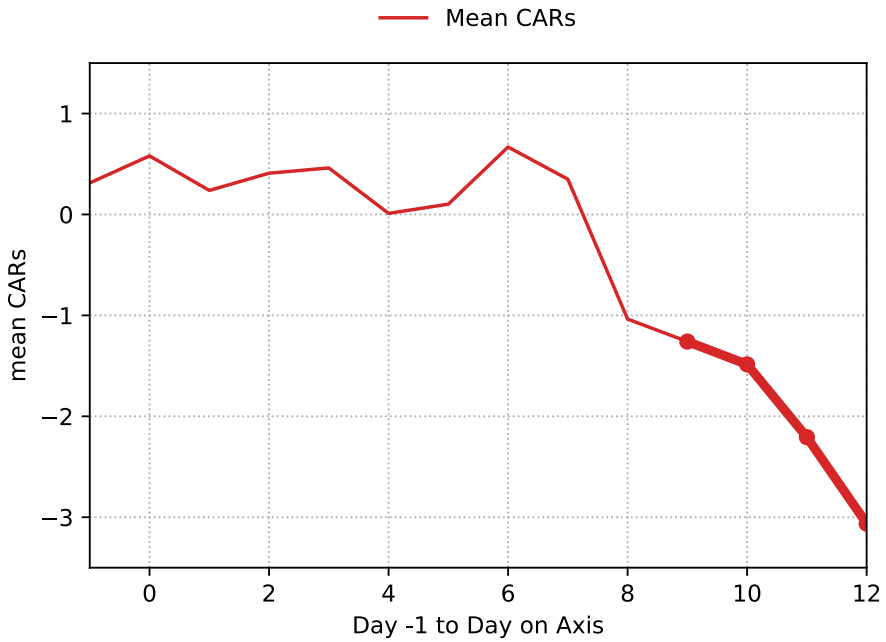


Figure 4: **Non-Exclusions and Exclusions Mean CARs relative to FF5 Factors**

This Figure plots the average cumulative abnormal returns (CARs) for a GPFG excluded firm and for firms which were recommended but not approved for exclusion (”non-exclusions”) around the exclusion announcement date.

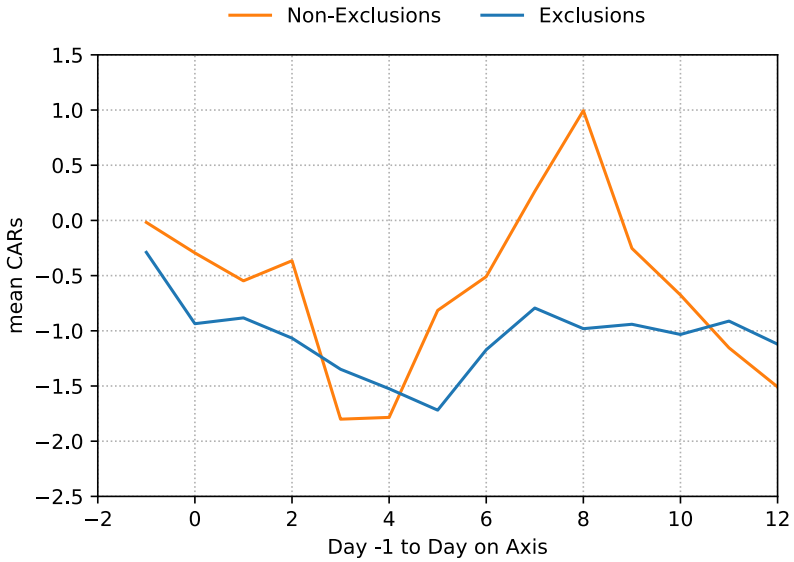
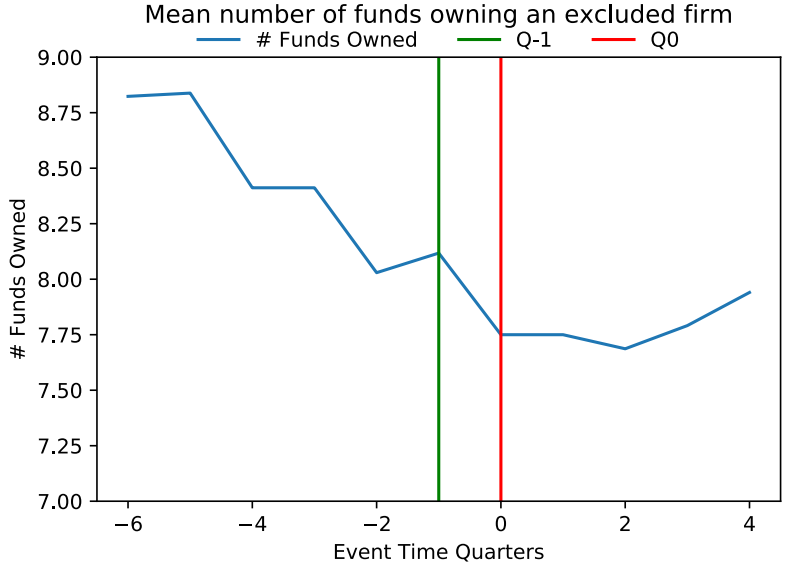


Figure 5: **Pension Fund ownership of excluded firms**

The Figures plot the mean number of pension funds which own shares in an excluded firm in the quarters around the exclusion announcements

(a) Coal Firms

Graph of pension fund ownership levels for firms excluded under the coal criterion



(b) Tobacco Firms

Graph of pension fund ownership levels for firms excluded under the tobacco criterion

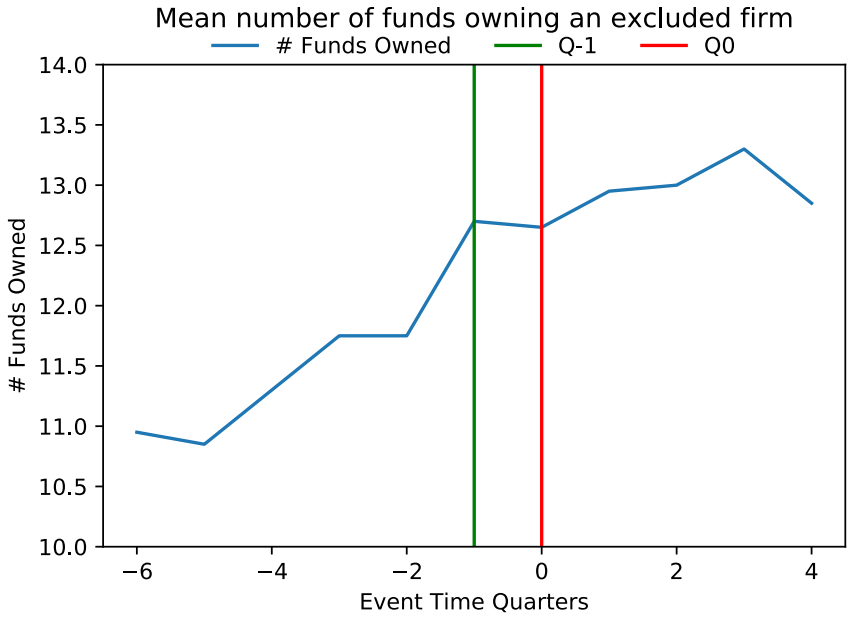
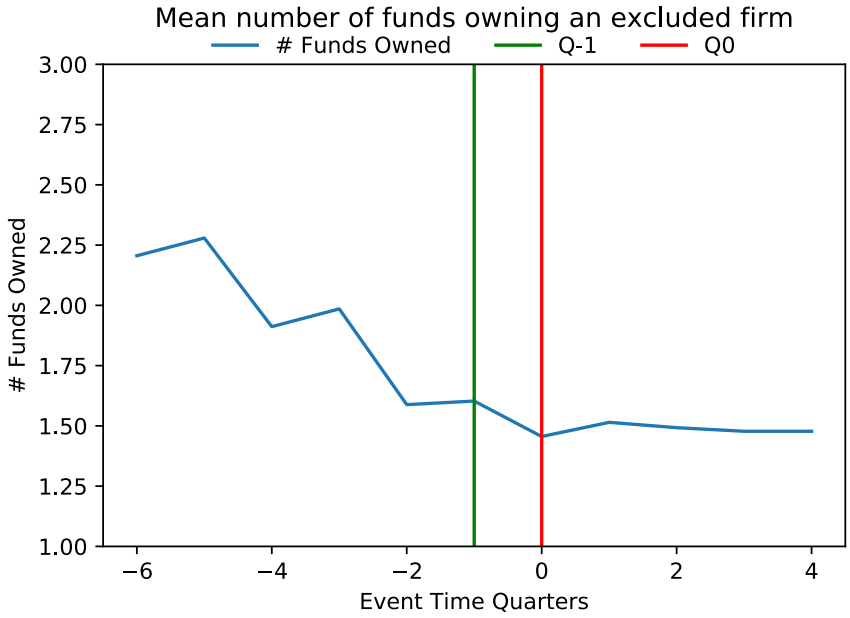


Figure 6: **European Pension Fund ownership of excluded firms**

The Figures plot the mean number of pension funds which own shares in an excluded firm headquartered in Europe in the quarters around the exclusion announcements

(a) Coal Firms

Graph of pension fund ownership levels for firms excluded under the coal criterion



(b) Tobacco Firms

Graph of pension fund ownership levels for firms excluded under the tobacco criterion

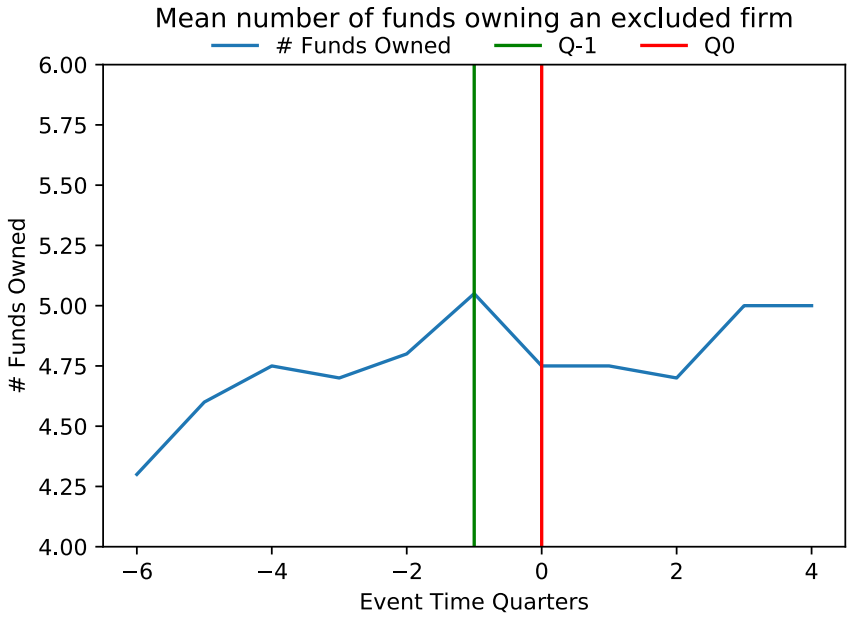
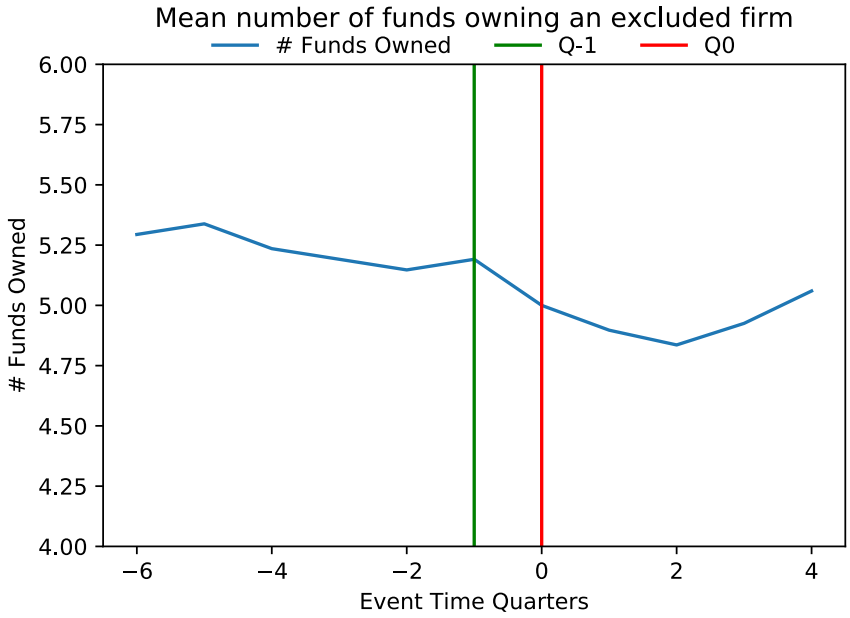


Figure 7: **US Pension Fund ownership of excluded firms**

The Figures plot the mean number of pension funds which own shares in an excluded firm headquartered in the USA in the quarters around the exclusion announcements

(a) Coal Firms

Graph of pension fund ownership levels for firms excluded under the coal criterion



(b) Tobacco Firms

Graph of pension fund ownership levels for firms excluded under the tobacco criterion

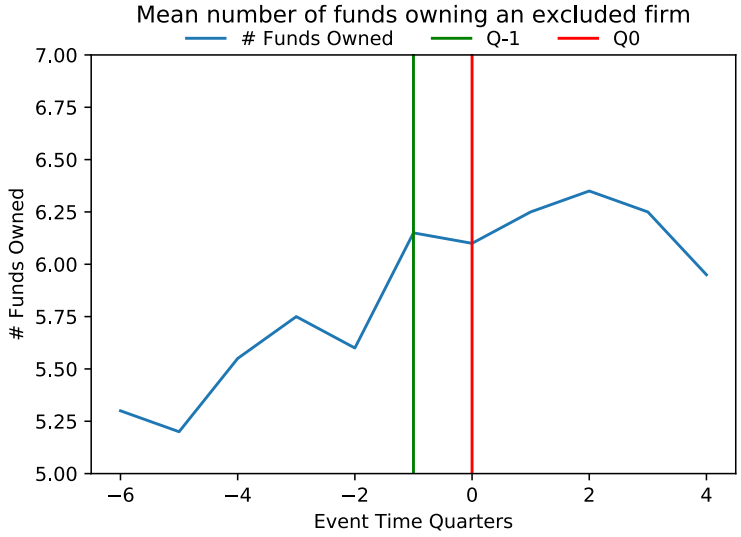
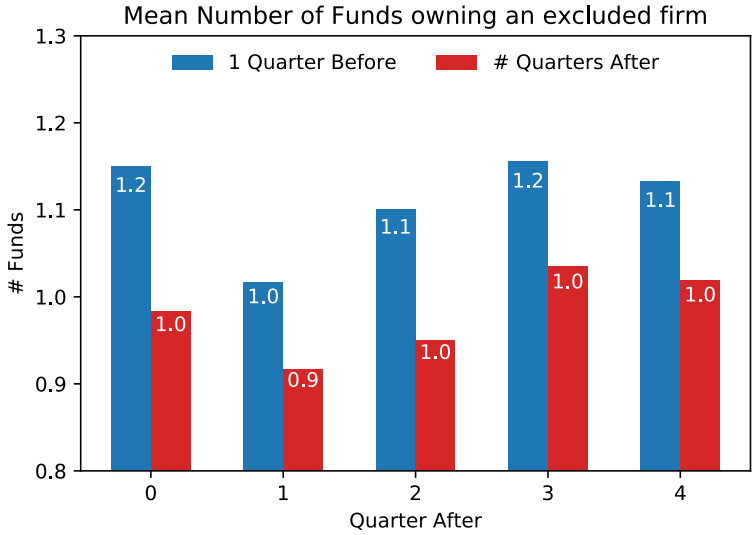


Figure 8: **US Non-index Responsible Fund Ownership**

The Figures plot the mean number of US non-index mutual funds with an ethical or social component in their mandates which own shares in an excluded US-listed firm in the quarters around the exclusion announcements. The blue bars report average ownership levels in Quarter -1 relative to the event and the red bars display the levels of ownership in the Quarter on the x-axis (2 to 4). Not all funds report ownership levels in each quarter so the fund sample size changes over time which is why the Quarter -1 number also changes in the following quarters.

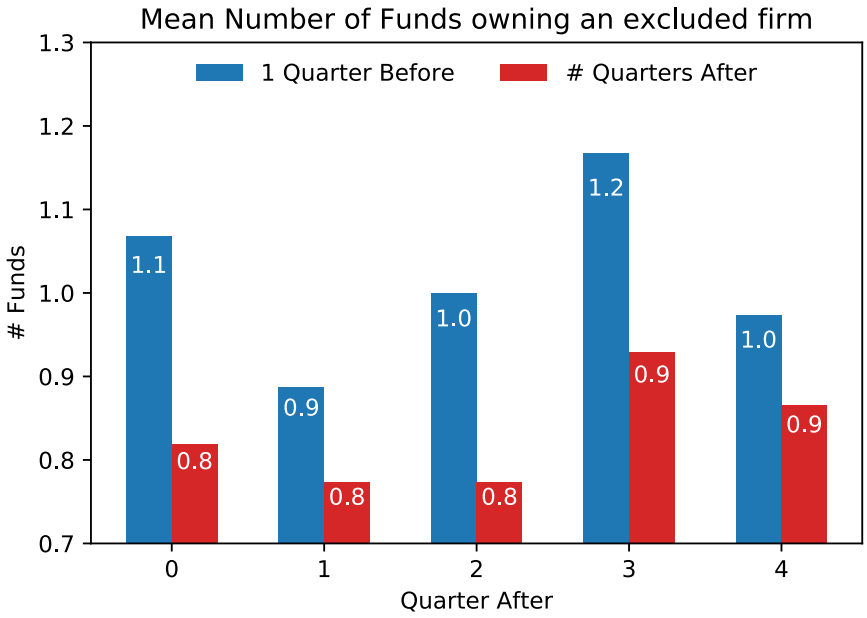
(a) All firms

Graph of ownership levels for US-listed excluded firms



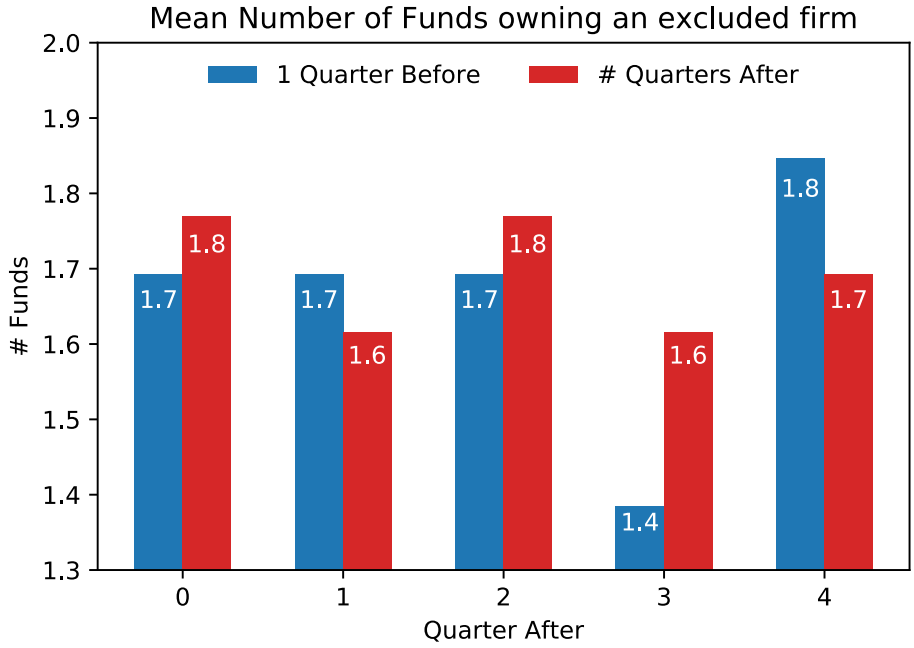
(b) Product Firms

Graph of ownership levels for US-listed firms excluded under the product criteria



(a) Conduct Firms

Graph of ownership levels for US-listed firms excluded under the conduct criteria



11 Tables

Table 1: Summary Statistics

The tables describe the summary statistics for the sample used in the paper
Panel A: Norges Bank excluded companies sample as of end May 2017 - Returns Analysis
This Panel shows the construction of the final sample from the total list of exclusions and how this splits into conduct and product-based exclusions

Status	Events
excluded (any time)	150
exclusion revoked	13
excluded again	2
returns or factor data issues	2
misc (lack of clarity on status)	4
Total Sample	144
conduct-based exclusions	36
product-based exclusions	108
currently excluded	126

Panel B: Norges Bank excluded companies sample as of end May 2017 - Exclusions by Category

This Panel displays the exclusions sample split by sub-category. The second column shows many of the exclusions in each split are matched to firms in the CRSP data, which includes only US-listed firms. The CRSP-matched sample is used in the US Ethical mutual funds ownership analysis

Exclusions	Events	Events in CRSP Database
Conduct	36	13
conduct - other particularly serious violations of fundamental ethical norms	7	5
conduct - serious violations of human rights	3	1
conduct - severe environmental damage	21	7
conduct - companies supplying arms or military equipment to Burma	1	0
conduct - serious violations of individuals rights in war or conflict	3	0
conduct - gross corruption	1	0
Product	108	47
production of cluster munitions	6	4
production of nuclear weapons	14	9
production of tobacco	20	10
production of coal or coal-based energy	68	24

Panel C: Exclusion Sample, events over time, until end May 2017

This Panel displays the sample by year of exclusion. The second column shows many of the exclusions in each year are matched to firms in the CRSP data, which includes only US-listed firms. The CRSP-matched sample is used in the US Ethical mutual funds ownership analysis

Year	Events	Events in CRSP Database
2005	8	6
2006	10	6
2007	4	2
2008	5	2
2009	5	3
2010	19	9
2011	5	2
2012	1	0
2013	9	3
2014	0	0
2015	4	1
2016	64	24
2017	10	2

Panel D: Exclusion Sample, events by country , until end May 2017

This Panel displays the exclusions sample by firm headquarters. The second column shows many of the exclusions in each country are matched to firms in the CRSP data, which includes only US-listed firms. The third column shows the region of the exclusions in each country. The final column displays the Fama French regional factors which are applied for the firms in each country when calculating abnormal returns around the exclusion events.

Country	Events	Events in CRSP Database	Region	Fama French Factors
United States	45	45	North America	North America
China	13	2	Asia-Pacific	Asia-Pacific ex Japan
India	12	1	Asia-Pacific	Asia-Pacific ex Japan
Malaysia	9	0	Asia-Pacific	Asia-Pacific ex Japan
United Kingdom	8	3	Europe	Europe
Japan	7	0	Asia-Pacific	Japan
Hong Kong	6	0	Asia-Pacific	Asia-Pacific ex Japan
South Korea	5	2	Asia-Pacific	Asia-Pacific ex Japan
Canada	5	3	North America	North America
Israel	4	1	Asia-Pacific	Asia-Pacific ex Japan
Australia	3	0	Asia-Pacific	Asia-Pacific ex Japan
Poland	3	0	Europe	Europe
France	2	0	Europe	Europe
Mexico	2	0	Central America	Global ex US
South Africa	2	1	Africa	Global ex US
Chile	2	0	South America	Global ex US
Czech Republic	2	0	Europe	Europe
Brazil	2	0	South America	Global ex US
Philippines	2	0	Asia-Pacific	Asia-Pacific ex Japan
Netherlands	1	0	Europe	Europe
Italy	1	0	Europe	Europe
Russia	1	0	Asia-Pacific	Asia-Pacific ex Japan
Indonesia	1	0	Asia-Pacific	Asia-Pacific ex Japan
Sweden	1	1	Europe	Europe
Peru	1	0	South America	Global ex US
Greece	1	0	Europe	Europe
Ireland	1	0	Europe	Europe
Thailand	1	0	Asia-Pacific	Asia-Pacific ex Japan
Bermuda	1	1	West Indies	North America

Panel E: Exclusion Sample, events by industry, by end May 2017

This Panel displays the exclusions sample by firm industry. The second column shows many of the exclusions in each industry are matched to firms in the CRSP data, which includes only US-listed firms.

Industry	Events	Events in CRSP Database
Electric Utilities	31	14
Independent Power Producers and Energy Traders	22	5
Aerospace and Defense	17	12
Tobacco	16	9
Coal and Consumable Fuels	12	3
Diversified Metals and Mining	6	2
Industrial Conglomerates	5	1
Construction and Engineering	4	1
Forest Products	4	0
Gold	3	2
Fertilizers and Agricultural Chemicals	3	2
Multi-Utilities	3	3
Oil and Gas Exploration and Production	4	2
Hypermarkets and Super Centers	2	1
Steel	2	1
Copper	1	1
Environmental and Facilities Services	1	0
Automobile Manufacturers	1	0
Real Estate Operating Companies	1	0
Specialty Chemicals	1	0
Paper Products	1	1
Trading Companies and Distributors	1	0
Casinos and Gaming	1	0
Communications Equipment	1	0
Heavy Electrical Equipment	1	0

Table 2: Exclusion Sample, firm characteristics, sample up to end of May 2017

This Panel displays the characteristics of the exclusions sample across several metrics, taken from Datastream. Age is the year when company accounts are first available for a firm versus the event date. Firm size is market capitalisation at day -3 relative to the exclusion day. The market-to-book ratio is also taken from event day -3. Average share turnover is calculated as the mean share turnover in days -14 to -3 relative to the event.

Metric	N	Mean	Median	Min	Max	Stdev
Age	141	20.25	19	1	36	8.65
Size ($bn)	144	12.01	4.28	0.03	201.68	22.27
Market to Book	140	2.44	1.58	0.00	26.95	3.49
Turnover as a % of Free Float (in %)	139	0.8	0.5	0.0004	13.0	1.4

Table 3: Abnormal Returns for Exclusions

This table displays the abnormal returns for the exclusions sample and relevant splits. The abnormal returns are calculated relative to the regional Fama French Factors. The statistics are described in detail in the Methodology subsection of the paper.

Panel A: All Exclusions, N = 144

Abnormal returns for full exclusions sample

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-0.94	-3.51***	-2.82***	-2.81***	-1.82*
-1 to 5	-1.72	-3.62***	-3.98***	-3.96***	-2.57**
6 to 12	0.60	1.51	1.96*	1.95*	1.26

Panel B: Product Exclusions, N = 108

Abnormal returns for firms excluded under the product criteria

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-1.08	-3.64***	-2.47**	-2.45**	-1.45
-1 to 5	-1.92	-3.60***	-3.92***	-3.90***	-2.30**
6 to 12	0.91	1.73*	2.06**	2.05**	1.21

Panel C: Conduct Exclusions, N = 36

Abnormal returns for firms excluded under the conduct criteria

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-0.49	-0.90	-1.37	-1.37	-1.24
-1 to 5	-1.11	-1.17	-1.18	-1.18	-1.06
6 to 12	-0.34	0.15	0.35	0.35	0.31

Panel D: Coal Exclusions, N = 68

Abnormal returns for firms excluded under the coal criterion

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-1.31	-3.30***	-2.02**	-2.01**	-1.10
-1 to 5	-2.58	-3.67***	-4.49***	-4.47***	-2.46**
6 to 12	1.56	1.97**	2.46**	2.45**	1.34

Panel E: Total ex. Coal Exclusions, N = 76

Abnormal returns for all excluded firms except those excluded under the coal criterion

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-0.60	-1.66*	-1.98**	-1.97**	-1.72*
-1 to 5	-0.94	-1.45	-1.23	-1.23	-1.07
6 to 12	-0.26	0.18	0.37	0.37	0.32

Panel F: Asia-Pacific Exclusions, N = 64

Abnormal returns for excluded firms in the Asia-Pacific region

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	0.02	-0.23	-0.44	-0.44	-0.33
-1 to 5	-1.09	-1.66*	-1.63	-1.62	-1.21
6 to 12	0.03	0.19	0.45	0.45	0.34

Panel G: North American Exclusions, N = 51

Abnormal returns for excluded firms in the North America region

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-2.45	-5.96***	-4.03***	-4.01***	-2.36**
-1 to 5	-3.81	-4.97***	-5.18***	-5.16***	-3.03***
6 to 12	1.56	2.42**	2.19**	2.17**	1.28

Panel H: European Exclusions, N = 20

Abnormal returns for excluded firms in Europe

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	0.03	0.20	0.13	0.13	0.12
-1 to 5	1.01	0.52	0.88	0.88	0.82
6 to 12	-0.36	-0.23	0.46	0.46	0.43

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 4: Abnormal Returns for Reinclusions

This table displays the abnormal returns for excluded firms which are later reincluded in the investment universe. The abnormal returns are calculated around the reinclusion announcements and are relative to the regional Fama French Factors. The statistics are described in detail in the Methodology subsection of the paper.

Reinclusions, N = 11

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	0.58	0.69	-0.02	-0.02	-0.02
-1 to 5	0.10	-0.06	-1.01	-1.00	-0.98
6 to 12	-3.17	-1.76*	-2.20**	-2.19**	-2.13**

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 5: Summary statistics for regression variables

This table shows summary statistics for a number of variables describing a characteristic of the excluded firms. Log M/B is the log of a firm's market-to-book ratio at day -3 relative to the exclusion announcement date. Average past return is the average return in the 5 previous working days (in event time days -7 to -3). Turnover is the average share turnover over days -14 to -3 relative to the event divided by the number of shares of the firm at day -3 (times 100). Log firm age is the log of firm age, where age is calculated from the year when company accounts are first available until the event date. The other variables are dummies for the region where a firm's headquarter is based, whether he exclusion is under the conduct or product criteria as well as the subcategory criterion which was applied, e.g. the coal criterion falls under the product criteria. There is also a dummy which identifies excluded firms which were later reincluded in the Funds investment universe. The "change in decision maker" dummy is 1 for firms excluded following the final decision-maker for exclusions changing from the Norwegian Ministry of Finance to Norges Bank.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
Log M/B	138	0.201	0.395	−1.155	−0.043	0.199	0.419	1.431
Average past return	144	0.078	0.994	−3.639	−0.355	0.0003	0.431	3.058
Turnover as % of Free Float	139	0.833	1.403	0.0004	0.272	0.492	0.814	12.964
Log firm age	142	1.247	0.255	0.000	1.088	1.279	1.431	1.556
North America	144	0.354	0.480	0	0	0	1	1
Europe	144	0.139	0.347	0	0	0	0	1
South America	144	0.035	0.184	0	0	0	0	1
Africa	144	0.014	0.117	0	0	0	0	1
Asia Pacific	144	0.444	0.499	0	0	0	1	1
Central America	144	0.014	0.117	0	0	0	0	1
Conduct	144	0.250	0.435	0	0	0	0.2	1
Product	144	0.750	0.435	0	0.8	1	1	1
change in decision maker	144	0.542	0.500	0	0	1	1	1
Later Reincluded Companies	144	0.076	0.267	0	0	0	0	1
Other Exclusions (cond)	144	0.049	0.216	0	0	0	0	1
Human Rights Exclusions (cond)	144	0.021	0.143	0	0	0	0	1
Environment Exclusions (cond)	144	0.146	0.354	0	0	0	0	1
Burma Exclusions (cond)	144	0.007	0.083	0	0	0	0	1
War and Conflict Exclusions (cond)	144	0.021	0.143	0	0	0	0	1
Corruption Exclusions (cond)	144	0.007	0.083	0	0	0	0	1
Cluster Exclusions (prod)	144	0.042	0.201	0	0	0	0	1
Nuclear Exclusions (prod)	144	0.097	0.297	0	0	0	0	1
Tobacco Exclusions (prod)	144	0.139	0.347	0	0	0	0	1
Coal Exclusions (prod)	144	0.472	0.501	0	0	0	1	1

Table 6: CAR FF5 Model regressions

The table shows the regression results of a number of OLS regressions where the independent variable is firm cumulative abnormal returns for days -1 to relative to the exclusion announcements and the independent variables are various firm and event characteristics, described in Table 5. Standard errors are clustered at the exclusion announcement time

	Dependent variable:			
	CARs -1 to 5	CARs -1 to 5	CARs -1 to 5	CARs -1 to 5
	(1)	(2)	(3)	(4)
Constant	7.00	6.75	7.03	7.94*
	(4.52)	(4.64)	(4.52)	(4.49)
Conduct	−0.39		−0.35	−0.31
	(1.01)		(0.98)	(1.11)
Coal Exclusions (prod)		−0.25		
		(1.82)		
Later Reincluded Companies			−0.58	
			(1.73)	
Not Excluded				−0.59
				(3.47)
Log size ($M)	−0.24	−0.24	−0.24	−0.14
	(0.87)	(0.89)	(0.87)	(0.68)
Log M/B	−1.07	−1.27	−1.05	−1.22
	(1.05)	(1.69)	(1.04)	(1.14)
Average past return	−0.23	−0.23	−0.20	−0.85
	(0.53)	(0.51)	(0.52)	(0.54)
Turnover as % of Free Float	−1.42**	−1.45**	−1.42**	−1.34**
	(0.59)	(0.58)	(0.59)	(0.59)
Log firm age	−5.58**	−5.31*	−5.62**	−5.08**
	(2.34)	(2.95)	(2.33)	(2.21)
Asia Pacific	0.53	0.51	0.55	−1.59
	(1.68)	(1.69)	(1.68)	(2.50)
North America	0.36	0.38	0.41	−1.55
	(1.83)	(1.79)	(1.88)	(2.56)
Europe	3.12*	3.10**	3.20*	1.00
	(1.60)	(1.56)	(1.66)	(2.56)
Observations	133	133	133	143
R^2	0.12	0.12	0.12	0.11
Adjusted R^2	0.06	0.06	0.05	0.04
Residual Std. Error	6.62 (df = 123)	6.62 (df = 123)	6.65 (df = 122)	6.76 (df = 132)

Note: *p<0.1; **p<0.05; ***p<0.01
Standard Errors clustered at divestment announcement time

Table 7: Turnover and CARs by region

This table displays how firm turnover as a percentage of free float and cumulative abnormal returns differ by the region where an excluded firm's headquarters is based.

Region	Turnover as % of Free Float	CARs -1 to 5	N
North America	1.26	-3.87	50
Asia-Pacific	0.65	-1.09	64
Europe	0.54	0.54	17
Africa, Central and South America	0.21	1.56	8

Table 8: Abnormal Returns for the Oil & Gas sector exclusion proposal, 16 November 2017

This table displays the abnormal returns around the NBIM (Norges Bank Investment Management) proposal o drop Oil and Gas stocks from the portfolio benchmark. The announcement was made on 16^{th} November 2017. The sample is the constituents of the Thomson Reuters' Global Oil and Gas index, where return data is available in Datastream (289 out of 294 cases). Abnormal returns are benchmarked relative to the Global Fama French 5 factors. The statistics used are described in he Methodology subsection of the paper

Oil & Gas, N = 289

Event Days	avg CARs FF5	J_1 FF5	z-score FF5	J_2 FF5	J_2^* FF5
-1 to 0	-0.72	-1.48	-5.77***	-5.74***	-1.34
-1 to 5	-0.58	0.43	-2.72***	-2.71***	-0.63
6 to 12	-1.12	-3.54***	-3.46***	-3.44***	-0.80

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 9: Capital IQ ownership data of excluded firms, up to end March 2018

The table shows the availability of Capital IQ ownership data for the excluded firms in event time. The maximum number of firms for which data can be available is 144 (sample size). Going forwards in event time, firms drop out when a firm is re-included in the portfolio universe or the exclusion quarter is past March 2018 for a particular firm (latest data point). De-listed, merged, and otherwise contaminated firms are also excluded. Data is not available prior to 2004, so the oldest exclusions start dropping out in event time as we move backwards in event time for them.

Event Time Quarter	# Firms Available
-8	134
-7	136
-6	143
-5	144
-4	144
-3	144
-2	144
-1	144
0	144
1	144
2	143
3	143
4	140
5	130
6	116
7	115
8	68

Table 10: Average number of All Pension Funds owning shares in Excluded companies, Quarter -1 vs Quarters -4 to 4, data up to end March 2018

This table shows the average number of pension funds owning shares in excluded firms around the exclusion announcements. In each row we compare the mean ownership number in the quarter prior to the exclusions ("Funds Q-1") to the average number of pension funds owning shares in Quarters -4 to Quarter 4 relative to the exclusion quarter ("Funds Q#"). The first columns shows which is the comparison quarter in the given row. "Firms sample" displays the sample of excluded firms with available data in each event time quarter, constructed as described in Table 9. The final column displays how many pension funds in total owned shares in any of the excluded firms.The table is constructed using ownership data from Capital IQ. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different.

Panel A: All Pension Funds, All excluded Firms

Changes to ownership by all pension funds for all excluded firms

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	10.14	9.99	-0.15	144	134
-3	10.14	10.15	0.01	144	130
-2	10.14	9.94	-0.20*	144	124
-1	10.14	10.14	0.00	144	119
0	10.14	9.97	-0.17*	144	121
1	10.14	9.99	-0.15	144	123
2	10.15	10.10	-0.06	143	126
3	10.15	10.36	0.21	143	129
4	9.96	10.23	0.27	140	131

Panel B: All Pension Funds, Product-excluded Firms

Changes to ownership by all pension funds for firms excluded under the product criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	10.77	10.60	-0.17	108	118
-3	10.77	10.86	0.09	108	120
-2	10.77	10.50	-0.27*	108	114
-1	10.77	10.77	0.00	108	110
0	10.77	10.48	-0.29***	108	111
1	10.77	10.55	-0.22	108	114
2	10.79	10.64	-0.15	107	119
3	10.79	10.98	0.19	107	121
4	10.79	11.07	0.27	107	122

Panel C: All Pension Funds, Conduct-excluded Firms

Changes to ownership by all pension funds for firms excluded under the conduct criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	8.25	8.14	-0.11	36	89
-3	8.25	8.00	-0.25	36	83
-2	8.25	8.25	0.00	36	82
-1	8.25	8.25	0.00	36	79
0	8.25	8.44	0.19	36	81
1	8.25	8.31	0.06	36	80
2	8.25	8.47	0.22	36	81
3	8.25	8.53	0.28	36	81
4	7.24	7.52	0.27	33	81

Panel D: All Pension Funds, Coal-excluded Firms

Changes to ownership by all pension funds for firms excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	8.12	8.41	0.29	68	78
-3	8.12	8.41	0.29	68	76
-2	8.12	8.03	-0.09	68	76
-1	8.12	8.12	0.00	68	73
0	8.12	7.75	-0.37**	68	73
1	8.12	7.75	-0.37*	68	77
2	8.12	7.69	-0.43**	67	77
3	8.12	7.79	-0.33*	67	78
4	8.12	7.94	-0.18	67	78

Panel E: All Pension Funds, All exc. Coal-excluded Firms

Changes to ownership by all pension funds for all excluded firms except for those excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	11.95	11.39	-0.55**	76	107
-3	11.95	11.70	-0.25	76	105
-2	11.95	11.64	-0.30**	76	99
-1	11.95	11.95	0.00	76	97
0	11.95	11.96	0.01	76	99
1	11.95	11.99	0.04	76	99
2	11.95	12.22	0.28*	76	103
3	11.95	12.63	0.68**	76	105
4	11.64	12.33	0.68**	73	107

Panel F: All Pension Funds, Tobacco-excluded Firms

Changes to ownership by all pension funds for firms excluded under the tobacco criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	12.70	11.30	-1.40**	20	73
-3	12.70	11.75	-0.95**	20	74
-2	12.70	11.75	-0.95***	20	71
-1	12.70	12.70	0.00	20	70
0	12.70	12.65	-0.05	20	71
1	12.70	12.95	0.25	20	72
2	12.70	13.00	0.30	20	75
3	12.70	13.30	0.60	20	76
4	12.70	12.85	0.15	20	77

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 11: Average number of European Pension Funds owning shares in Excluded companies, Quarter -1 vs Quarters -4 to 4, data up to end March 2018

This table shows the average number of European pension funds owning shares in excluded firms around the exclusion announcements. In each row we compare the mean ownership number in the quarter prior to the exclusions ("Funds Q-1") to the average number of pension funds owning shares in Quarters -4 to Quarter 4 relative to the exclusion quarter ("Funds Q#"). The first columns shows which is the comparison quarter in the given row. "Firms sample" displays the sample of excluded firms with available data in each event time quarter, constructed as described in Table 9. The final column displays how many pension funds in total owned shares in any of the excluded firms. The table is constructed using ownership data from Capital IQ. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different.

Panel A: European Pension Funds, All Excluded Firms

Changes to ownership by European pension funds for all excluded firms

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	3.00	3.00	0.00	144	40
-3	3.00	3.08	0.08	144	41
-2	3.00	2.90	-0.10*	144	40
-1	3.00	3.00	0.00	144	39
0	3.00	2.88	-0.12**	144	39
1	3.00	2.90	-0.10	144	40
2	3.02	2.87	-0.15*	143	41
3	3.02	3.00	-0.02	143	41
4	2.97	2.96	-0.01	140	42

Panel B: European Pension Funds, Product-excluded Firms

Changes to ownership by European pension funds for firms excluded under the product criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	2.96	3.03	0.06	108	39
-3	2.96	3.12	0.16	108	40
-2	2.96	2.82	-0.14*	108	39
-1	2.96	2.96	0.00	108	38
0	2.96	2.77	-0.19***	108	38
1	2.96	2.81	-0.15	108	39
2	2.99	2.81	-0.18*	107	40
3	2.99	2.98	-0.01	107	40
4	2.99	2.99	0.00	107	41

Panel C: European Pension Funds, Conduct-excluded Firms

Changes to ownership by European pension funds for firms excluded under the conduct criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	3.11	2.92	-0.19	36	28
-3	3.11	2.97	-0.14	36	28
-2	3.11	3.11	0.00	36	28
-1	3.11	3.11	0.00	36	28
0	3.11	3.22	0.11	36	28
1	3.11	3.17	0.06	36	28
2	3.11	3.06	-0.06	36	28
3	3.11	3.06	-0.06	36	28
4	2.91	2.88	-0.03	33	27

Panel D: European Pension Funds exc. Norges, Coal-excluded Firms

Changes to ownership by European pension funds for firms excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	1.60	1.91	0.31**	68	20
-3	1.60	1.99	0.38***	68	20
-2	1.60	1.59	-0.01	68	20
-1	1.60	1.60	0.00	68	19
0	1.60	1.46	-0.15*	68	19
1	1.60	1.51	-0.09	68	21
2	1.63	1.49	-0.13	67	21
3	1.63	1.48	-0.15	67	21
4	1.63	1.48	-0.15	67	21

Panel E: European Pension Funds, All exc. Coal-excluded Firms

Changes to ownership by European pension funds for all excluded firms except for those excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	4.25	3.97	-0.28**	76	37
-3	4.25	4.07	-0.18*	76	38
-2	4.25	4.07	-0.18**	76	37
-1	4.25	4.25	0.00	76	37
0	4.25	4.16	-0.09	76	37
1	4.25	4.14	-0.11	76	38
2	4.25	4.09	-0.16	76	39
3	4.25	4.34	0.09	76	39
4	4.21	4.33	0.12	73	40

Panel F: European Pension Funds, Tobacco-excluded Firms

Changes to ownership by European pension funds for firms excluded under the tobacco criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	5.05	4.75	-0.30	20	29
-3	5.05	4.70	-0.35	20	29
-2	5.05	4.80	-0.25	20	29
-1	5.05	5.05	0.00	20	29
0	5.05	4.75	-0.30**	20	29
1	5.05	4.75	-0.30	20	29
2	5.05	4.70	-0.35	20	29
3	5.05	5.00	-0.05	20	29
4	5.05	5.00	-0.05	20	30

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 12: Average number of United States Pension Funds owning shares in Excluded companies, Quarter -1 vs Quarters -4 to 4, data up to end March 2018

This table shows the average number of United Sates pension funds owning shares in excluded firms around the exclusion announcements. In each row we compare the mean ownership number in the quarter prior to the exclusions ("Funds Q-1") to the average number of pension funds owning shares in Quarters -4 to Quarter 4 relative to the exclusion quarter ("Funds Q#"). The first columns shows which is the comparison quarter in the given row. "Firms sample" displays the sample of excluded firms with available data in each event time quarter, constructed as described in Table 9. The final column displays how many pension funds in total owned shares in any of the excluded firms. The table is constructed using ownership data from Capital IQ. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different.

Panel A: United States Pension Funds, All Firms

Changes to ownership by United States pension funds for all excluded firms

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	5.90	5.84	-0.06	144	51
-3	5.90	5.88	-0.03	144	46
-2	5.90	5.82	-0.08	144	43
-1	5.90	5.90	0.00	144	42
0	5.90	5.82	-0.08	144	43
1	5.90	5.76	-0.14*	144	42
2	5.90	5.83	-0.07	143	43
3	5.90	5.87	-0.03	143	46
4	5.76	5.74	-0.01	140	45

Panel B: United States Pension Funds, Product Firms

Changes to ownership by United States pension funds for firms excluded under the product criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	6.54	6.43	-0.11	108	42
-3	6.54	6.56	0.03	108	44
-2	6.54	6.44	-0.10	108	40
-1	6.54	6.54	0.00	108	40
0	6.54	6.43	-0.11*	108	41
1	6.54	6.37	-0.17	108	41
2	6.53	6.42	-0.11	107	43
3	6.53	6.49	-0.05	107	44
4	6.53	6.51	-0.02	107	43

Panel C: No Filter, United States Pension Funds, Conduct Firms

Changes to ownership by United States pension funds for firms excluded under the conduct criteria

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	4.00	4.08	0.08	36	46
-3	4.00	3.81	-0.19	36	39
-2	4.00	3.97	-0.03	36	39
-1	4.00	4.00	0.00	36	38
0	4.00	4.00	0.00	36	39
1	4.00	3.94	-0.06	36	38
2	4.00	4.06	0.06	36	38
3	4.00	4.03	0.03	36	38
4	3.24	3.24	0.00	33	38

Panel D: United States Pension Funds, Coal-excluded Firms

Changes to ownership by United States pension funds for firms excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	5.19	5.24	0.04	68	27
-3	5.19	5.19	0.00	68	27
-2	5.19	5.15	-0.04	68	27
-1	5.19	5.19	0.00	68	27
0	5.19	5.00	-0.19**	68	27
1	5.19	4.90	-0.29**	68	27
2	5.16	4.84	-0.33***	67	27
3	5.16	4.93	-0.24**	67	28
4	5.16	5.06	-0.10	67	27

Panel E: United States Pension Funds, All exc. Coal-excluded Firms

Changes to ownership by United States pension funds for all excluded firms except for those excluded under the coal criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	6.54	6.38	-0.16	76	51
-3	6.54	6.49	-0.05	76	46
-2	6.54	6.42	-0.12	76	43
-1	6.54	6.54	0.00	76	42
0	6.54	6.55	0.01	76	43
1	6.54	6.54	0.00	76	42
2	6.54	6.70	0.16*	76	43
3	6.54	6.70	0.16	76	45
4	6.30	6.37	0.07	73	45

Panel F: United States Pension Funds, Tobacco-excluded Firms

Changes to ownership by United States pension funds for firms excluded under the tobacco criterion

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	6.15	5.55	-0.60**	20	33
-3	6.15	5.75	-0.40**	20	33
-2	6.15	5.60	-0.55**	20	31
-1	6.15	6.15	0.00	20	31
0	6.15	6.10	-0.05	20	31
1	6.15	6.25	0.10	20	32
2	6.15	6.35	0.20	20	34
3	6.15	6.25	0.10	20	34
4	6.15	5.95	-0.20	20	34

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 13: Responsible Funds Sample and firms matched to CRSP data

This Table shows how I created the sample for ethical mutual funds and matched excluded firms.

Panel A: Responsible Funds matched to CRSP Data

The panel displays the construction of the mutual funds sample. The first raw "Total from TR (Eikon)" lists the number of mutual funds with an Ethical (first column) or Social (second column) screens as part of their mandate in the Thomson Reuters' Fund Screener database in Eikon. The next row, "Funds with listed CUSIP" lists how many of those funds have a listed CUSIP number. Then the next row "Matched to CRSP" details how many of those funds are matched to the WRDS (Wharton Research Data Services) CRSP database (Center for Research in Security Prices) which contains information on mutual fund holdings. The next row shows now many funds are removed as they are duplicates of other funds in the list. ("Duplicate Portfolios due to Fund Class"). I subtract that row from the previous row ("Matched to CRSP ") to calculate the numbers in the next row "Final Matched to CRSP" . The row below , "CRSP Holdings Data Available", shows how many of these funds have holdings data in the CRSP database. The final row, "Overlap Ethical & Social" lists the number of funds which have both an ethical and a social screen. For the analysis of holdings we use the number of funds with either a social or ethical screen holdings data available (177). Of these, only one fund has a social but not an ethical screen.

Number of Responsible Funds by Criteria	Ethical	Social
Total from TR (Eikon)	2151	226
Funds with listed CUSIP	221	211
Matched to CRSP	187	188
Duplicate Portfolios due to Fund Class	2	2
Final Matched to CRSP	185	186
CRSP Holdings Data Available	176	177
Overlap Ethical & Social	176	176

Panel B: Excluded Firms matched to CRSP Data

This panel describes the construction of the matched excluded firms sample for the ethical mutual funds holdings analysis. The first row "Total" shows the total number of exclusions (first column) and how they split across conduct and product-based exclusions (next two columns). The next row "Excluded Matched to CRSP" lists how many of these can be matched to the firms in the CRSP database. These are firms which are listed in the USA. The sample in this row is the one used in the analysis. The next row "Excluded owned by the Analysed Funds (at some point)" shows how many of the firms have been owned by one of the ethical or social mutual funds. Next, the table displays the overlap with reincluded firms, The "reincluded" row displays the total number of excluded firms which were later reincluded in the GPFG portfolio. The next row "Reincluded Matched to CRSP" lists how many of the reincluded firms have a matched in the CRSP database. Again, these are USA-listed excluded firms. Finally, the last row " Reincluded owned by the Analysed Funds (at some point)" displays how many of the reincluded firms which are matched in the CRSP database were at some point owned by one of the mutual funds in our database.

Excluded Firms	Total	Conduct	Product
Total	144	36	108
Excluded Matched to CRSP	60	13	47
Excluded owned by the Analysed Funds (at some point)	57	13	44
Reincluded	13	6	7
Reincluded Matched to CRSP	6	3	3
Reincluded owned by the Analysed Funds (at some point)	6	3	3

Table 13: Average number of Funds owning shares in Excluded companies, Quarter -1 vs Quarters -4 to 4, Non-Index Funds, All Firms, data to end November 2017

This table shows panels of the number US non-index mutual funds with an ethical or social component in their mandates which own shares in an excluded US-listed firm in the quarters around the exclusion announcements.

This table shows the average number of US non-index mutual funds with an ethical or social component in their mandates owning shares in excluded firms around the exclusion announcements. In each row we compare the mean ownership number in the quarter prior to the exclusions ("Funds Q-1") to the average number of mutual funds owning shares in Quarters -4 to Quarter 4 relative to the exclusion quarter ("Funds Q#"). The first columns shows which is the comparison quarter in the given row. "Firms sample" displays the sample of excluded firms with available data in each event time quarter, constructed as described in Table 13 Panel B. The final column displays how many mutual funds in total owned shares in any of the excluded firms.The table is constructed using ownership data from CRSP. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different. Not all funds report ownership levels in each quarter so the fund sample size changes over time. Therefore, the Funds Q-1 number also changes in each quarter, as it is calculated based on the ownership levels of the funds which have reported their ownership levels in both Q-1 and the relevant comparison quarter.

Panel A: All Firms

Changes to ownership by all non-index ethical mutual funds for all excluded firms

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	0.88	0.95	0.07	60	109
-3	0.98	1.00	0.02	60	116
-2	1.02	0.98	-0.03	60	116
-1	1.32	1.32	0.00	60	127
0	1.15	0.98	-0.17**	60	120
1	1.02	0.92	-0.10	60	119
2	1.10	0.95	-0.15	60	114
3	1.16	1.03	-0.12	58	112
4	1.13	1.02	-0.11	53	106

Panel B: Product Firms

Changes to ownership by all non-index ethical mutual funds for product-excluded firms

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	0.73	0.82	0.09	44	104
-3	0.77	0.77	0.00	44	111
-2	0.82	0.82	0.00	44	112
-1	1.18	1.18	0.00	44	123
0	1.07	0.82	-0.25**	44	116
1	0.89	0.77	-0.11	44	118
2	1.00	0.77	-0.23*	44	114
3	1.17	0.93	-0.24*	42	107
4	0.97	0.86	-0.11	37	101

Panel C: Conduct Firms

Changes to ownership by all non-index ethical mutual funds for conduct-excluded firm

Quarter # Before or After	Funds Q-1	Funds Q#	Difference	Firms Sample	Funds Sample
-4	1.62	1.62	0.00	13	103
-3	1.92	2.00	0.08	13	104
-2	1.92	1.77	-0.15	13	107
-1	2.08	2.08	0.00	13	118
0	1.69	1.77	0.08	13	114
1	1.69	1.62	-0.08	13	111
2	1.69	1.77	0.08	13	109
3	1.38	1.62	0.23	13	107
4	1.85	1.69	-0.15	13	103

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 14: Changes to Firm Performance metrics, Year -1 vs Years 0 to 2, data to 8th May 2018

This table shows how firm performance metric evolve around the exclusion announcements. The first column in each panel describes the sample for the row, all exclusions or either conduct or product-based exclusions. Since the analysed metrics change annually, the next column "Year #" shows the comparison year in each row. The following column "Mean in Year-1" displays the value for each metric in the year prior to exclusions, Then the next column "Mean in Year #" shows the metric's value in the relevant Year in event time, listed in the "Year #" column. Year 0 is the year of the exclusion announcement, Year 1 is the year following the exclusion announcements, and Year 2 is two years following the announcements. The "Difference" column is the difference between the value of each metric in the previous two columns, the year prior to the exclusion and the relevant comparison year. The last column "# Firms" show the number of excluded firms examined in each row. This can be below the total sample size due to data availability and as recent exclusions drop out in event time, as data runs to 8th May 2018. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different.

Panel A: Receivables/5 Year Average Assets

Changes in receivables scaled by firm 5 year average assets for excluded firms around the exclusion announcements.

Exclusions	Year #	Mean in Year-1	Mean in Year #	Difference	# Firms
All	0	34.49	34.67	0.18	138
All	1	33.66	34.06	0.39	126
All	2	29.47	29.92	0.45	61
Conduct	0	31.49	32.10	0.61	32
Conduct	1	29.28	30.27	0.99	29
Conduct	2	27.49	28.58	1.10	21
Product	0	35.40	35.45	0.05	106
Product	1	34.97	35.19	0.22	97
Product	2	30.51	30.63	0.11	40

Panel B: Net Sales/L1 Assets

Changes in net sales scaled by firm lagged firm assets for excluded firms around the exclusion announcements.

Exclusions	Year #	Mean in Year-1	Mean in Year #	Difference	# Firms
All	0	0.63	0.64	0.01	140
All	1	0.66	0.67	0.01	129
All	2	0.88	0.98	0.10**	64
Conduct	0	0.76	0.78	0.02	35
Conduct	1	0.82	0.83	0.00	32
Conduct	2	0.80	0.93	0.13***	24
Product	0	0.58	0.59	0.01	105
Product	1	0.60	0.62	0.01	97
Product	2	0.93	1.02	0.09	40

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 15: Excluded Firms change in Environmental, Social and Governance (ESG) Metrics, MSCI data

This table shows how ESG metrics change for the excluded firms around the month of the exclusion announcements. The first column in each panel lists the metric which is being examined. Since the analysed metrics are provided monthly, the next column "Month #" shows the comparison month in each row. The following column "Mean Month-1" displays the value for each metric in the month prior to exclusions, Then the next column "Mean Month #" shows the metric's value in the relevant month in event time, listed in the "Month #" column. Monty 0 is the month of the exclusion announcement, Month 3 is three months following the announcements, and so on. The "Difference" column is the difference between the value of each metric in the previous two columns, the month prior to the exclusion and the relevant comparison month. The last column "# Firms" show the number of excluded firms examined in each row. This can be below the total sample size due to data availability and as recent exclusions drop out in event time, as data runs to October 2018. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different. The metrics analysed in the table are the firms separate Environmental, Social, and Governance scores. A "Weighted-Average Key Issue Score" is then created combining all firm scores. This is industry-adjusted to generate a score comparable across companies with different lines of business in the "Final Industry-Adjusted Company Score". Scores range from 0 (worst) t 10 (best)

Panel A: All Exclusions

Changes to ESG ratings for all excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Final Industry-Adjusted Company Score	0	3.43	3.45	0.03	85
Final Industry-Adjusted Company Score	3	3.44	3.65	0.21**	82
Final Industry-Adjusted Company Score	6	3.44	3.63	0.19*	82
Final Industry-Adjusted Company Score	12	3.37	3.95	0.57***	78
Final Industry-Adjusted Company Score	18	3.45	4.04	0.59***	76
Weighted-Average Key Issue Score	0	4.05	4.04	-0.00	65
Weighted-Average Key Issue Score	3	4.06	4.11	0.06	62
Weighted-Average Key Issue Score	6	4.06	4.12	0.07	62
Weighted-Average Key Issue Score	12	4.08	4.34	0.26***	61
Weighted-Average Key Issue Score	18	4.08	4.37	0.29***	60
Environmental Pillar Score	0	4.18	4.18	0.00	85
Environmental Pillar Score	3	4.21	4.29	0.07	82
Environmental Pillar Score	6	4.21	4.30	0.09	82
Environmental Pillar Score	12	4.16	4.47	0.32***	78
Environmental Pillar Score	18	4.16	4.50	0.34***	76
Social Pillar Score	0	3.90	3.89	-0.02	85
Social Pillar Score	3	3.91	3.94	0.03	82
Social Pillar Score	6	3.91	4.07	0.16	82
Social Pillar Score	12	3.91	4.01	0.11	78
Social Pillar Score	18	3.90	3.97	0.07	76
Governance Pillar Score	0	5.21	5.21	-0.00	85
Governance Pillar Score	3	5.21	5.20	-0.01	82
Governance Pillar Score	6	5.21	5.05	-0.16	82
Governance Pillar Score	12	5.19	4.94	-0.25	78
Governance Pillar Score	18	5.21	4.85	-0.35	76

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Panel B: Product Exclusions

Changes to ESG ratings for product-excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Final Industry-Adjusted Company Score	0	3.34	3.35	0.00	69
Final Industry-Adjusted Company Score	3	3.36	3.54	0.19*	66
Final Industry-Adjusted Company Score	6	3.36	3.53	0.17	66
Final Industry-Adjusted Company Score	12	3.27	3.94	0.68***	62
Final Industry-Adjusted Company Score	18	3.27	3.99	0.72***	62
Weighted-Average Key Issue Score	0	4.08	4.07	-0.01	55
Weighted-Average Key Issue Score	3	4.09	4.17	0.08	52
Weighted-Average Key Issue Score	6	4.09	4.15	0.06	52
Weighted-Average Key Issue Score	12	4.12	4.40	0.28***	51
Weighted-Average Key Issue Score	18	4.12	4.42	0.30***	51
Environmental Pillar Score	0	4.18	4.17	-0.01	69
Environmental Pillar Score	3	4.21	4.29	0.08	66
Environmental Pillar Score	6	4.21	4.30	0.08	66
Environmental Pillar Score	12	4.15	4.50	0.36***	62
Environmental Pillar Score	18	4.15	4.55	0.40***	62
Social Pillar Score	0	3.75	3.74	-0.01	69
Social Pillar Score	3	3.75	3.85	0.09	66
Social Pillar Score	6	3.75	4.03	0.28*	66
Social Pillar Score	12	3.74	4.01	0.27	62
Social Pillar Score	18	3.74	3.89	0.15	62
Governance Pillar Score	0	5.33	5.33	0.00	69
Governance Pillar Score	3	5.33	5.29	-0.05	66
Governance Pillar Score	6	5.33	5.10	-0.23*	66
Governance Pillar Score	12	5.32	4.99	-0.33	62
Governance Pillar Score	18	5.32	4.81	-0.51**	62

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Panel C: Conduct Exclusions

Changes to ESG ratings for conduct-excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Final Industry-Adjusted Company Score	0	3.78	3.91	0.12	16
Final Industry-Adjusted Company Score	3	3.78	4.09	0.31*	16
Final Industry-Adjusted Company Score	6	3.78	4.05	0.26	16
Final Industry-Adjusted Company Score	12	3.78	3.97	0.18	16
Final Industry-Adjusted Company Score	18	4.26	4.28	0.02	14
Weighted-Average Key Issue Score	0	3.88	3.90	0.02	10
Weighted-Average Key Issue Score	3	3.88	3.84	-0.04	10
Weighted-Average Key Issue Score	6	3.88	3.97	0.09	10
Weighted-Average Key Issue Score	12	3.88	4.03	0.15	10
Weighted-Average Key Issue Score	18	3.84	4.08	0.23	9
Environmental Pillar Score	0	4.20	4.24	0.04	16
Environmental Pillar Score	3	4.20	4.26	0.07	16
Environmental Pillar Score	6	4.20	4.31	0.12	16
Environmental Pillar Score	12	4.20	4.37	0.17	16
Environmental Pillar Score	18	4.22	4.28	0.06	14
Social Pillar Score	0	4.56	4.50	-0.06	16
Social Pillar Score	3	4.56	4.33	-0.23	16
Social Pillar Score	6	4.56	4.25	-0.31	16
Social Pillar Score	12	4.56	4.04	-0.52	16
Social Pillar Score	18	4.64	4.35	-0.29	14
Governance Pillar Score	0	4.68	4.67	-0.01	16
Governance Pillar Score	3	4.68	4.82	0.14	16
Governance Pillar Score	6	4.68	4.83	0.15	16
Governance Pillar Score	12	4.68	4.74	0.06	16
Governance Pillar Score	18	4.72	5.06	0.34	14

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Table 16: Excluded Firms change in Environmental ESG Metrics, MSCI data

This table shows how the metrics comprising the environmental ESG score change for the excluded firms around the month of the exclusion announcements. The first column in each panel lists the metric which is being examined. Since the analysed metrics are provided monthly, the next column "Month #" shows the comparison month in each row. The following column "Mean Month-1" displays the value for each metric in the month prior to exclusions, Then the next column "Mean Month #" shows the metric's value in the relevant month in event time, listed in the "Month #" column. Monty 0 is the month of the exclusion announcement, Month 3 is three months following the announcements, and so on. The "Difference" column is the difference between the value of each metric in the previous two columns, the month prior to the exclusion and the relevant comparison month. The last column "# Firms" show the number of excluded firms examined in each row. This can be below the total sample size due to data availability and as recent exclusions drop out in event time, as data runs to October 2018. A paired t-test is used to determine if the before and after ownership levels are statistically significantly different. Scores range from 0 (worst) t 10 (best)

Panel A: All Exclusions

Changes to Environmental ratings for all excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Climate Change Theme Score	0	4.60	4.63	0.03	62
Climate Change Theme Score	3	4.71	4.87	0.17	58
Climate Change Theme Score	6	4.71	4.99	0.28	58
Climate Change Theme Score	12	4.69	5.45	0.76***	57
Climate Change Theme Score	18	4.64	5.38	0.74***	57
Natural Capital Theme Score	0	3.35	3.35	-0.00	61
Natural Capital Theme Score	3	3.35	3.38	0.03	57
Natural Capital Theme Score	6	3.35	3.25	-0.10	57
Natural Capital Theme Score	12	3.39	3.65	0.26	56
Natural Capital Theme Score	18	3.39	3.88	0.49***	56
Pollution & Waste Theme Score	0	3.75	3.73	-0.02	62
Pollution & Waste Theme Score	3	3.74	3.76	0.02	58
Pollution & Waste Theme Score	6	3.74	3.75	0.00	58
Pollution & Waste Theme Score	12	3.77	3.97	0.20*	57
Pollution & Waste Theme Score	18	3.74	4.08	0.34***	56
Environmental Opportunities Theme Score	0	4.33	4.32	-0.01	51
Environmental Opportunities Theme Score	3	4.29	4.46	0.17	49
Environmental Opportunities Theme Score	6	4.29	4.52	0.23	49
Environmental Opportunities Theme Score	12	4.31	4.53	0.22	48
Environmental Opportunities Theme Score	18	4.28	4.37	0.09	47

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Panel B: Product Exclusions

Changes to Environmental ratings for product-excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Climate Change Theme Score	0	4.45	4.46	0.01	55
Climate Change Theme Score	3	4.58	4.75	0.17	52
Climate Change Theme Score	6	4.58	4.84	0.26	52
Climate Change Theme Score	12	4.55	5.34	0.78***	51
Climate Change Theme Score	18	4.55	5.42	0.86***	51
Natural Capital Theme Score	0	3.28	3.28	0.00	54
Natural Capital Theme Score	3	3.29	3.33	0.05	51
Natural Capital Theme Score	6	3.29	3.15	-0.13	51
Natural Capital Theme Score	12	3.33	3.60	0.27	50
Natural Capital Theme Score	18	3.33	3.84	0.51***	50
Pollution & Waste Theme Score	0	3.78	3.77	-0.01	54
Pollution & Waste Theme Score	3	3.80	3.84	0.04	51
Pollution & Waste Theme Score	6	3.80	3.82	0.01	51
Pollution & Waste Theme Score	12	3.83	4.07	0.23*	50
Pollution & Waste Theme Score	18	3.83	4.23	0.40***	50
Environmental Opportunities Theme Score	0	4.28	4.24	-0.04*	46
Environmental Opportunities Theme Score	3	4.23	4.39	0.16	44
Environmental Opportunities Theme Score	6	4.23	4.48	0.25	44
Environmental Opportunities Theme Score	12	4.26	4.48	0.22	43
Environmental Opportunities Theme Score	18	4.26	4.34	0.09	43

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Panel C: Conduct Exclusions

Changes to Environmental ratings for conduct-excluded firms around the time of the exclusion announcements

MSCI ESG Metric	Month #	Mean Month -1	Mean Month #	Difference	# Firms
Climate Change Theme Score	0	5.81	5.97	0.16	7
Climate Change Theme Score	3	5.80	5.92	0.12	6
Climate Change Theme Score	6	5.80	6.28	0.48	6
Climate Change Theme Score	12	5.80	6.43	0.63	6
Climate Change Theme Score	18	5.37	5.07	-0.30	6
Natural Capital Theme Score	0	3.93	3.89	-0.04	7
Natural Capital Theme Score	3	3.88	3.73	-0.15	6
Natural Capital Theme Score	6	3.88	4.05	0.17	6
Natural Capital Theme Score	12	3.88	4.07	0.18	6
Natural Capital Theme Score	18	3.88	4.20	0.32	6
Pollution & Waste Theme Score	0	3.55	3.47	-0.08	8
Pollution & Waste Theme Score	3	3.30	3.21	-0.09	7
Pollution & Waste Theme Score	6	3.30	3.24	-0.06	7
Pollution & Waste Theme Score	12	3.30	3.26	-0.04	7
Pollution & Waste Theme Score	18	2.92	2.82	-0.10	6
Environmental Opportunities Theme Score	0	4.82	5.02	0.20	5
Environmental Opportunities Theme Score	3	4.82	5.02	0.20	5
Environmental Opportunities Theme Score	6	4.82	4.86	0.04	5
Environmental Opportunities Theme Score	12	4.82	5.00	0.18	5
Environmental Opportunities Theme Score	18	4.55	4.70	0.15	4

Significance: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

Chapter 2

The Long-run Consequences of Portfolio Sector Exclusion

The Long-run Consequences of Portfolio Sector Exclusion*

Vaska Atta-Darkua[1], David Chambers and Elroy Dimson

Abstract

Using industry indices spanning 1900–2018 we investigate the impact of sector screening for a well-diversified long-term investor and identify a number of risks associated with the strategy. Specifically, we examine the impact on the portion of the portfolio which is being replaced by other assets. Market returns are not a substitute for industry returns due to changes in sector composition over time and the large cross-sectional dispersion of sector returns. The net impact of sector exclusion can be proxied by allocating a portion of the portfolio to a strategy that is long the market and short a sector. This strategy would introduce unwanted geographic tilts into the portfolio and could suffer substantial and lengthy drawdowns.

JEL Classification: G11; G15; G23; G41; Q51

Keywords: Divestment; activism; fossil fuel; corporate social responsibility (CSR); environmental, social, and governance (ESG)

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1. Introduction

Many investors incorporate screening within their investment process. Negative screening involves excluding companies based on criteria that may be specific to individual issuers. For instance, potential investments may be regarded as unsuitable based on environmental, social and governance (ESG) criteria. Frequently, screening is based on a set of common attributes. There are many examples. Health-oriented investors prohibit exposure to tobacco companies; strict Sharia funds avoid bank stocks; Dharmic investors may exclude animal-testing pharma companies; social campaigners avoid firms with poor ESG scores; politically sensitive investors avoid rogue-state markets; institutions constrained to spending income underweight low-yield stocks; and climate-change activists pursue divestment from fossil-fuel businesses.

In some cases, the decision to disinvest is commercial, such as the argument that certain assets are likely to become stranded because of anticipated impairment of their economic value. As an illustration, transport has a long history of investments becoming of little value after a change in technology. As we discuss later, canals drastically cut the cost of long-distance transport and largely obsoleted horse-drawn carts; railways then hugely undercut the cost of water-based transport and drove canals into disuse; and for long-distance travel, buses and aircraft then propelled many rail services into financial distress. Looking forward, autonomous vehicles and transport-as-a-service may force automobile plants into closure. At each disruptive event, older assets that have not reached the end of their technical life are no longer able to earn the return anticipated at an earlier date. Recently, the transition to a low-carbon economy has led to predictions that fossil-fuel industries will become stranded assets, and that it could be financially attractive to sell out of coal, oil and gas stocks.

The Cambridge Zero Carbon Society, a fossil fuel divestment pressure group at the University of Cambridge, argues that "[w]ithout an ethical policy … [university] money is invested in companies without consideration for their catastrophic environmental impact. At a global and local level, the impacts of these investments contradict the University's positive contributions to society, through research and education. Over the past two years the global divestment movement has shown the very real path to a sustainable, fossil-free future. Regarding fossil fuels, the divestment campaign is the fastest growing climate justice campaign in history." ((CZCS(2018)). Other institutional investors, such as Norges Bank Investment Management, which runs the Norwegian Government Pension Fund Global (GPFG), have financial motives to consider fossil fuel divestment. They are concerned that the Fund is

overexposed to the oil and gas sector once government revenue exposures to the sector are taken into account (NBIM (2017)).

Whether divesting for financial or moral reasons, investors can benefit from being aware of the potential costs of such exclusion strategies. The paper makes use of a unique long-term sector returns dataset covering 1900-2018 for the United Kingdom and the United States in order to examine the effect of excluding sectors from the financial portfolio of a well-diversified long-term investor. Conventionally, research has focused on comparing the returns of an unscreened portfolio to those of negatively screened portfolios and showed that differences tend to be minimal (Humphrey and Tan (2014), Sauer (1997)). Our research focuses on the net impact on the part of the portfolio which is being excluded and replaced with other investments. Using this method, we identify several potential financial costs of such sector exclusion strategies.

First, given that sector divestment is equivalent to allocating a portion of the portfolio to a strategy that is long the market and short a sector, we investigate whether the market seems a suitable substitute for sector returns. We conclude that this does not seem to be the case as there is a large cross-sectional dispersion in sector returns as well as substantial changes in sector composition over time. Second, we document substantial historic maximum drawdowns of strategies which are long the market and short sectors. Therefore, investment managers engaging in sector exclusion can experience prolonged periods of high losses on the portion of their portfolio which would have otherwise been invested in the particular sector. This can make it difficult to sustain such strategies over the long term, particularly if the managers are accountable to stakeholders which can put pressure on their investment decisions. Third, we show that sectors often have large country concentrations. As a result, sector exclusion would likely introduce unwanted geographic tilts into the portfolio. Finally, historically the inflation-adjusted capital returns of a number of mineral resources which we analyse have been lower than the inflation-adjusted returns observed in the equity markets. Therefore, even if investors are trying to hedge existing mineral resource holdings, as can be the case for fossil fuel-funded sovereign wealth funds, we argue that sector exclusion may not achieve this goal.

In brief, we find that the downside risk from sector exclusions is higher than many writers have suggested. For long-term investors, the consequences of sector exclusion are likely to be economically significant.

The paper proceeds as follows. Section 2 reviews the relevant literature, while Section 3 briefly showcases the conventional method to examine the impact of sector exclusions. In

Section 4 we describe the data we use for our long terms return analysis. In Section 5 we describe how long term returns can differ from market return and examine how a strategy emulating the net impact of sector exclusions can suffer substantial drawdowns. Next, in Section 6 we investigate the relationship between resource company share prices and the price of the underlying resources which they acquire. Furthermore, we also demonstrate the geographic tilts which sector exclusions can introduce into portfolios. Finally, Section 7 summarises and concludes our findings.

2. Related Literature

Forming optimal portfolios using mean variance analysis is a cornerstone of modern portfolio theory (Markowitz (1956), Markovitz (1959), Sharpe (1970)). In that context, excluding sectors from a portfolio reduces the potential portfolio allocations over which optimisation can be performed and could lead to optimal portfolios with lower returns or higher risk than those on an unconstrained efficiency frontier. Lack of diversification in portfolios has traditionally been discussed in a geographic context, where it has been documented that investors tend to tilt portfolios towards domestic ("home bias", e.g. Kang and Stulz (1997)) or local firms (Coval and Moskowitz (1999)). With respect to sector exclusions, data from the Global Sustainable Investment Alliance (2018) and US SIF (2018) indicates that 17% of professionally managed assets in the US and 37.6% of those in Europe are managed in portfolios using negative/exclusionary screening.

However, evidence that exclusions affect portfolio returns has been slim. Most studies examine the returns of constrained relative to non-constrained portfolios. On one hand, Humphrey and Tan (2014) do not find evidence that excluding sin stocks from portfolios ("negative screening") has an impact on risk or returns.[2] In the same vein, Sauer (1997) examines the performance of the Domini 400 Social index (DSI) relative to comparable non-constrained portfolios and finds similar results. In order to estimate the potential costs of boycotting South African stocks during the Apartheid Grossman and Sharpe (1986) construct a South Africa Free (SAF) portfolio of NYSE stocks and also find minimal financial implications of using the portfolio to engage in a simple divestment strategy. The evidence on Shariah-compliant screenings is mixed. Hoepner, Rammal and Rezec (2011) find that Islamic funds from countries with developed Islamic financial markets perform in line with non-

[2] They also find no impact due to positive screening.

screened benchmarks, while those from developed countries with lower Islamic services expertise underperform their comparable benchmarks.

On the other hand, in the endowment universe Cornell (2015) estimates that the costs to five prominent US endowments from divesting the fossil fuel sector would be non-insignificant.[3] Examining portfolios comprised of mutual funds, Geczy, Stambaugh and Levin (2005) argue that the cost of being constrained due to Socially Responsible Investing (SRI) is minor for investors who follow CAPM[4] and higher for an investor investing in line with the three-factor model of Fama and French (1993). Furthermore, Belghitar, Clark and Deshmukh (2014) argue that while in a mean variance framework portfolios are minimally affected by exclusions, ethical investors pay a price in terms of the higher distributional moments such as skewness and kurtosis.

At the same time, sector returns can vary significantly from those in the market, as we also demonstrate later in the paper. Academic research has primarily focused on the performance of controversial, so called "sin" stocks, versus the market or comparable "non-sin" stocks. Notably, Hong and Kacperczyk (2009) find that sin stocks have superior returns to matched "non-sin" stocks. In the same vein, Fabozzi, Ma and Oliphant (2008) show that "sin" stock portfolios have positive marked-adjusted returns. However, Blitz and Fabozzi (2017) document no "sin" stock outperformance after adjusting for the five factors of Fama French (Fama and French (2015)).

One reason why controversial "sin" sectors could outperform the market is investor disagreement on future returns. Fama and French (1997), note that these could result in violations to the Capital Asset Pricing Model (CAPM). Such disagreements could in turn manifest as higher returns for controversial stocks if they face short-selling constraints. In this scenario positively inclined investors buy stocks and push prices up while negatively inclined investors are restricted in their ability to reflect their beliefs into stock prices (Miller (1977)). Such a theory is consistent with empirical findings by Carlin, Longstaff and Matoba (2014).

There is also some evidence that changes to demographic compositions can be used to predict industry returns (DellaVigna and Pollet, (2007)). Furthermore, industry concentration has been shown to affect stock returns so that stocks in industries with higher concentration tend to achieve lower returns (Hou and Robinson (2006)). Finally, Choi and Sias (2009) document institutional investor herding in and out of industries.

[3] Estimating a mean risk-adjusted shortfall of 0.23 percent per year, examining Columbia, Harvard, MIT, NYU and Yale.

[4] Capital Asset Pricing Model, see Sharpe (1964) and Lintner (1965)

An alternative method to exclude sectors, which is beyond the scope of this paper, could be to substitute a sector with a "mimicking portfolio". In that setting, a sector's factor exposures would be replicated by a portfolio of other assets which replicate its factor exposures (see Huberman, Kandel and Stambaughm(1987), Roll and Srivastava (2018), and Pukthuanthong, Roll, Wang and Zhang (2019)). The investor would then hold the mimicking portfolio instead of the given sector.

3. Returns of Negatively Screened Portfolios

As mentioned in the literature review, research has generally found that portfolios excluding sectors may achieve similar returns to non-screened portfolios. We briefly demonstrate this argument by examining the returns of portfolios in the UK and USA which we negatively screened via sector exclusion. For the UK, we use 35 FTSE Russell (2019) sectors and for the USA we use 49 sectors from the Ken French (2019) database.[5] In **Table 1** we show the results for a market cap weighted strategy of holding the whole market for the UK (Panel A) or USA (Panel B) compared to excluding a given sector and holding a market cap weighted portfolio of the remaining sectors. We choose to display scenarios excluding the sectors which correspond the closest to those for which we have long term returns and analyse in the next part of the paper.[6] Cumulative returns are also charted in **Figure 1**.

In the UK, over 32 years (data from 1986 to 2017), excluding our selected sectors could have led to a maximum loss of 16% of cumulative returns by excluding the Mining sector or a maximum gain of 9% higher cumulative returns if the Retail sector was excluded. Looking at annualised returns, excluding our selected sectors would achieve between 97 to 102 percent of

[5] For the UK, we use sector data from the FTSE Russell (2019) All Shares index, downloaded from Thomson Reuters (2019). There are 41 sectors in the index. One of them is not available for the UK (Nonequity Investment Instruments). We combine two sectors into a Real Estate sector in order to have data going back to the start of the rest of the series. We also take three super-sectors (Oil & Gas, Retail, Insurance) instead of their comprising sectors in order to have comparable sectors to those in the long term sector returns database. Since Retail and Insurance sector data is not available directly in Thomson Reuters (2019) we manually reconstruct them based on their comprising sectors. This leaves us with 35 sectors for the UK. For the US, we use the 49 sectors from the Ken French (2019) database.

[6] For the UK, the mapping of each long term returns sector to a FTSE Russell sector is as follows: Alcohol: Beverages; Banks: Banks; Chemicals: Chemicals; Engineering: Inds Eng; Food: Fd Producers; Insurance: Life Insurance + Nonlife insurance; Leisure: Travel & Leis; Mining: Mining; Motors: Auto & Parts; Oil: Oil & Gas; Retail: Fd & Drug Rt + Gen Retailers; Shipping: Inds Transpt; Textiles: Personal Goods; Tobacco: Tobacco. For the USA, the mapping of each long term returns sector to a Ken French sector where the names differ are Rail: Trans; and Tobac: Smoke.

mean returns. The results are similar for the USA, where we have 91 years of returns (1927 to 2017). Excluding the Oil sector would have led to a maximum loss of 9% of cumulative returns while excluding Transportation would have resulted in 13% higher cumulative returns over the analysis period. At an annualised return basis, returns for the negatively screened portfolios range from 99 to 101 percent of the market portfolio.

In unreported work (available on request from the authors) we perform a similar analysis using an annual rebalancing equal weighting strategy and a buy and hold equal weighting. We obtain results that are the essentially same as those using the market cap sector weighting method. Therefore, if we examine total portfolio returns when excluding a sector compared to market returns, the consequences of sector exclusions seem minimal.

However, this type of analysis masks the changes which occur at the level of the excluded part of the portfolio, which is being replaced by other assets. In this paper we aim to show how losses to the portion of the portfolio which is being excluded can be substantial due to the different distribution of market and sector returns. Therefore, the opportunity costs of excluding a sector can be high if we focus on the net impact on the changed part of the portfolio. We employ long term sector returns dataset from 1900, which we describe below, to showcase this argument.

4. Long Term Returns Data Sources[7]

Our study primarily examines the United Kingdom and the United States, with occasional references to other international evidence. We use the dataset compiled by Dimson, Marsh and Staunton (2018), hereafter referred to as the DMS database, the London Share Price Database (2018), and various public-domain and proprietary industry indices. The series begin at start-1900 or, occasionally, at later dates such as 1911.

Our long sample period witnessed many changes. As **Table 2** shows, the UK railway sector was extremely large at the start of 1900 but by 2018 it had shrunk almost to zero, whereas banking and insurance, beverages, tobacco and utilities survived. Moreover, some sectors changed radically: compare telegraphy in 1900 with telecoms in 2018. When analysing sector returns, we should therefore bear in mind that industries experienced great transformations. In 1900, telephones, cars, electric lighting, movies and recorded music were new technologies. Some industries were destined to grow, including electricity and power generation,

[7] This section extends and updates DMS (2018).

automobiles, airlines, oil and gas, information services, and entertainment; others such as horse-drawn carriages, canal boats and candles were destined to disappear.

For the UK market, industry indices are constructed based on the top 100 UK companies for the 1900-1955 period, and based on the London Share Price Database for 1956 to 1961. Following that period, we use FTSE International industry indices and predecessor indices assembled by the Institute of Actuaries and Financial Times. In 1900, over 65% by value of the total UK equity market was in industries that, today, no longer exist. In 2018, 47% by value of the total UK equity market was in industries that, in 1900, had not yet come into existence.

The evolution of the equity market in the United States resembles the United Kingdom. **Table 3** reports the breakdowns of market capitalisations in the USA. In 1900, over 80% by value of the US equity market was in industries that, today, no longer exist. In 2018, 62% by value of the US equity market was in industries that, in 1900, had not yet come into existence.

For the US equity market, the data sources employed are as follows. For 1900 to 1925, the 57 industry indices in Cowles (1938) are used. Of these, 20 industries start in 1900. For the later period of 1926 to the end of 2017, we use industry data reported by French (2018). His website contains 49 industries, of which 40 begin in 1926.

While our analysis is agnostic as to whether portfolios exclude controversial or non-controversial sectors, it is worth noting that the level of stigma which certain activities attract changes over time. Therefore, looking at long term returns can be affected by anachronism, where sectors which were not deemed controversial in the past carry stigma in the present and vice versa. For example, tobacco has converted into a controversial sector as evidence on the impact of smoking on health has increased and become generally accepted. Similarly, fossil fuel stocks have attracted attention by exclusion campaigners as the effects of climate change have gained the attention of the general public and governments around the world.

5. Main Analysis

1.1 Long-term Returns

We use the UK and US industry return series described above to examine our first question: In the long run, do sectors provide returns close to the market? **Table 4** Panels A and B display annualized returns for the total analysis period and for 25 year subperiods[8] for the UK and USA respectively. Then in **Table 5** we show the same results in Callan Periodic Tables, ranking each sector from the top to bottom performance for each time period. There is a wide variation of

[8] except the last subperiod which 18 years, from 2000 to 2017

sector and market returns, which, unsurprisingly, is more pronounced in the subperiods that the full historic sample. Notably, a few of the series start post 1900 – US oil starts in 1911 and UK Tobacco, Motors and Leisure start in 1920.

Figure 2 shows the 11 industries for which continuous data is available for the UK. Market returns are plotted in red, showing that £1 invested in the market in 1900 would have grown to £40,838 by the end of 2017, assuming dividends were reinvested. Over the 118 years since the start of the last century, the worst industry performer, engineering, would have increased to £3,388, providing an annualised return of 7.1%. The best-performing industry (alcoholic beverages) had a cumulative value in **Figure 2** of £403,234 that was 119 times as large as engineering. The annualised return from alcoholic beverages was 11.6%. The total return data is presented in **Table 6** Panel A shows the total return by sectors and for the Market for the full analysis period and by subperiods and Panel B displays sector total returns as multiples of the market total return over the same period. The results in the table demonstrate that even seemingly small changes in annualised mean returns can lead to large dispersions in total returns as they accumulate over time.

Due to post-war nationalisation, which was reversed in the Thatcher-era privatisations, there is a gap in the returns history for UK railways, utilities, telecoms, steel, coal and shipbuilding. As a thought experiment, we might imagine that these return gaps could be bridged. This would likely reveal still greater extremes of performance.

It should also be noted that **Figure 2** is subject to survivorship bias. In order to display a continuous 118-year return history for the displayed industries, the sample needs to be restricted to industries that existed in some form during 1900 and 2018, and every year in between. If we were able to access indices for industries that disappeared, the downside in **Figure 2** would be more dramatic. Similarly, if we were to incorporate business activities that were not initiated until after 1900, some of those would have recorded outstanding results. This further understates the extremes of performance experienced by sector indices.

Figure 3 displays the investment performance of the 15 US industries for which data is available from 1900. Market returns are plotted in red, showing that $1 invested in the market in 1900 would have grown to $47,661 by the end of 2017, assuming dividends were reinvested. In contrast, the worst industry performer, coal, would have increased to $1,612, providing an annualised return of 6.5%. The tobacco industry, which performed best, delivered an annualised return of 14.6%, and reached over $9.4m, almost 6,000 times higher than coal. Similarly to the UK results, US total returns are shown in **Table 7**. Differences in annualised

means again lead to large total return dispersions over the full 1900-2017 period and in the various subperiods.

The index series for the USA—like the UK data—also contains some industries with a gap. The industries for which we do not have a full 118-year record are banks, insurance and alcoholic beverages. Financial services were excluded from the Cowles indices. Notably, Alcohol was illegal during the prohibition era which lasted from 1922 to 1930. The vast majority of US alcohol firms did not survive prohibition period. Those which did so by diversifying their operations into "near-beer" non-alcohol beverages and other products, as well as offloading some of their real estate holdings.[9] The alcohol prohibition period represents an extreme case where the US alcohol sector was effectively screened out of investor portfolios as the industry moved underground.

Furthermore, the US equity market has witnessed many corporate failures, offset by a vibrant IPO market. So, like the UK, the range of long-term sector returns is again underestimated because of our focus in **Figure 3** on sectors with a 118-year history.

Using log returns, we also compute Pearson correlations, standard deviations, and betas for the sectors. Log returns are computed as:

$$\text{Return}_t = \ln (TR_t / TR_{t-1})$$

where we take the log of the ratio of total return index in one period and the preceding period.

Correlation are displayed in **Table 8**. The bottom row of the tables shows the mean correlation for each analysis period. Correlations for each sector are then tested for statistical significance relative to the mean. For 1900-2017 the mean excludes series which do not begin in 1900. These are Motors, Leisure, and Tobacco (1920) for the UK and Oil (1911) for the USA. Correlations for UK Motors, Leisure, and Tobacco are tested for significance compared to the mean correlation for all sectors using data from 1920 to 2017 in the 1900-2017 column. Similarly, for US Oil, in the 1900-2017 column, the mean the sector correlation is tested against is calculated using sector data for 1911-2017. This is also the case for all similar tables which have significance tests compared to the sector mean.

[9] Summarised in https://www.history.com/news/brewers-under-prohibition-miller-coors-busch-yuengling-pabst . And described in more detail in Ogle (2007)

Sectors tend to be highly correlated with the market over the long term and in the analysed subperiods. Recent returns for UK tobacco are an outlier, having only 15% correlation with the market for 2000-2017. US tobacco also shows low correlations with the market in the last two subperiods. Sector correlations also differ among one another, with a significant number of sectors having correlations which are significantly above or below the sector mean for each market and analysis period.

At the same time, a number of sectors have significantly different variances than the market. This is displayed in **Table 9** where we can see the standard deviations for sectors, again using log returns. A Levene test is applied to test for statistical significance in the difference of the sector variances vs the market. For the full period, at least half the sectors have significantly higher variances than the market. Across the subperiods, all sectors with statistically significantly different variances also exhibit higher volatility than that of the market, with the exception of US Telecoms which is in fact less volatile than the US market for 1900-1949. Nevertheless, this result could me mechanical due to differences in the level of diversification of the market versus individual sectors.

Still using log-returns, in **Table 10** we show sector betas relative to their respective markets. The dispersion in betas stems from the variability of sector standard deviations and sector correlations with the market.[10] For the full analysis period, around half the series in each market have betas statistically significantly different from the mean sector beta. This also broadly holds across the different subperiods, with the exception of the UK for 1900-1924.

The above-described differences result in substantial tracking errors between sector and market returns, which we have calculated using annual (non-log) returns. We measure tracking errors in two ways. The first is as a mean absolute deviation between sector and market returns, which is the absolute value of the difference in returns between a sector and the market in each year, averaged over the analysed periods. This is displayed in Panel A of the UK and US Tracking error tables (**Table 11** and **Table 12**). The second measure, presented in Panel B of the two tables, is the standard deviation of the variance of the difference of sector and market returns. This is the tracking error metric for fund vs benchmark return used in the asset management industry. For both Tracking error metrics, we also calculate the mean tracking error in each analysis period. In the UK, across the two metrics, Motors, Mining, Oil, and

[10] As well as being equal to the covariance of a sector with the market divided by the market variance, betas can also be defined as the correlation between a sector and the market times the standard deviation of the sector and divided by the market standard deviation.

Textiles have significantly higher tracking errors than the mean for their full analysis periods.[11] For the USA, Coal, Tobacco, and Paper have significantly higher tracking errors for the full analysis period.

To demonstrate how tracking errors can impact long-term returns, we calculate rolling annualized (i.e. geometric mean) returns for each sector and the market over 10, 20 and 30-year periods, with a one year rolling window. We then test if the rolling annualized returns for each sector are significantly different from those of the markets the sectors are in. The results are presented in **Table 13**. Naturally, the larger the holding period, the larger the probability the annualised rolling means will be more different. Around half of UK sectors and almost two thirds of US sectors have statistically significantly different 30-year annualized rolling returns relative to their respective markets. For both markets, the Tobacco sector outperforms the market over the three different rolling mean horizons. In the UK, this is also the case for Alcohol.[12] In both markets, Oil outperforms the market for the 20 and 30-year horizons. It also has a stronger performance over a 10-year horizon, but this is not statistically significant. Therefore, excluding "sin sectors" can be particularly costly for investors.

This large long-term variation in industry returns mirrors the dispersion of national equity market returns; see DMS (2018). We already know that past country returns provide little indication of future country returns (see Lally and Marsden (2004a, 2004b)). Predicting the fortunes of specific industries based on their past returns is similarly unlikely to be a successful. Indeed, Ilmanen (2011) argues that country and industry exposures are good examples of non-priced investment risks. A factor being priced would imply that it is expected to generate a long-run premium. Following Ilmanen, the prediction for an industry is that it would have an expected return that is close to other industries. Returns would be boosted or impeded only by industry exposure to priced factors such as a deviant market-to-book ratio or as a result of ostracism by a large cohort of investors.

For simplicity, we assume that industry exposure is not in itself a priced factor. However, sectors are not diversified portfolios, and they experience substantial tracking error over the long term as well as over the short term. Our analysis reveals striking return variation across sectors. Divesting from an industry, especially if it has a high market capitalisation and/or large idiosyncratic volatility, raises the likelihood of generating deviant portfolio performance.

[11] 1900-2017 for Mining and Oil, and 1920-2017 for Motors and Tobacco.

[12] we do not have a continuous US return series for alcohol due to the US prohibition.

Conclusion: Over the long run we find that sectors do not provide returns close to the market.

1.2 Drawdowns with Sector Exclusion

While we have documented the variability of realised returns, we have cautioned against extrapolating industry performance into the future. Pástor & Stambaugh (2012) point out that from an investor perspective, expected returns are more volatile over long horizons than shorter ones. Crucially, they examine the predictive return variance, rather than the realised variance, as they argue it is more representative of the investor experience. Observers can estimate the parameters of the historical return process, but this may not reflect the true population parameters. The true data generating process is unknown, and this contributes to the predictive variance being larger than the realised variance of returns. While mean reversion may reduce long-term return variances relative to their short-term counterparts, the other components have a stronger impact, resulting in greater uncertainty about return variability in the long term.

To provide more insight into the impact of sector exclusion strategies, we therefore investigate a strategy of holding a portfolio long the market and short various sectors. This provides an indication of some of the uncertainties investors face in practice. While in hindsight drawdowns can prove to be transient, investors have no way of knowing how long they may last. Furthermore, during particularly low return periods they may also face pressure from stakeholders to abandon the particular strategy, which would result in locking into unsatisfactory returns at a potentially disadvantageous time.

To illustrate the investment performance of the long-short strategy, we select oil as the sector to be shorted. The cumulative investment performance, plotted in **Figure 4**, is calculated in each period as:

$$(1 + R_{market}) / (1 + R_{industry})$$

The value of the portfolio for a period is multiplied by the value for the next period in order to generate a cumulative time series of total returns.

The same exercise is repeated for all sectors. In **Table 14** we show the annualised returns for such a strategy for the full analysis period and for selected subperiods and in **Table 16** we display the total returns at the end of each period.[13] If a strategy has lost money over the periods

[13] See **Table 15** for Callan Periodic Tables of the annualized returns.

the annualised returns will be less than zero and the total returns less than one. There is a wide variation in the realised annualised returns which propagates into even larger total return dispersions. In the UK, for the full analysis period, shorting Engineering and Motors would have been particularly profitable, while shorting Chemicals, Alcohol, and Tobacco would have been costly. In the US, shorting Coal and Ships would have been advantageous, while shorting Food, Electrical Equipment. Chemicals, and Tobacco would have been particularly detrimental to returns. The subperiod results, which often switch between positive and negative annualised returns, demonstrate that the shorting strategies do not consistently over or underperform. Therefore, past good performance cannot be extrapolated to predict good performance into the future and vice versa.

We now describe how we examine the downside risk from sector exclusion. Our focus is concern about switching from an unwanted exposure (for example, oil stocks) to a preferred alternative (for example, the equity market as a whole). The risk is the possibility of experiencing a dramatic fall in the value of the long-short portfolio (in our example, a long exposure to equities accompanied by a short position in oil stocks). Note that the long-short portfolio is automatically hedged against currency depreciation: losses will be attributable solely to the gap between the cumulative returns of the long and short positions.

Portfolio drawdowns are defined as the difference between the portfolio's value on a particular date and its high-water mark (the highest historic value up to that date). The interval from the date of the high-water mark to breaching the high-water mark again is the recovery period. The investment is said to be underwater from the date of the high-water mark to the end of the recovery period.

Cumulative drawdowns for oil are portrayed in **Figure 5** as percentages of the high-water mark. In the left-hand panel we consider the downside of a holding that is long the UK market and short the UK oil sector. This is a position that might sit alongside a fully diversified equity portfolio for the rest of the fund. We measure the drawdown in value relative to the portfolio's high-water mark.

With extended intervals of good and poor investment performance, a crucial question is how deep portfolio drawdowns can be, and how long the recovery period can be. To provide an answer, we compute the cumulative percentage decline in value from a high to successive subsequent dates. This indicates just how bad an investor's experience might have been if they had the misfortune to buy at the wrong time. The red area displays the results for the full

analysis period, and the blue area calculates the drawdown percentage when starting the strategy from 1950.

Using annual data for the UK from 1900 to 2018, we look in the left-hand panel of **Figure 5** at drawdowns for an oil-based long-short portfolio. The maximal drawdown is 96% (76%, from 1950). The downside risk for the US is similar. The right-hand panel of Figure 5 shows that, over the longest period for which we have a US oil index (1911 to 2018), the maximal drawdown is 83% (73%, from 1950).

Is the oil sector in some way unusual? **Figure 6** presents histograms for the maximal drawdown for long-short portfolios constructed for each of the sectors plotted in Figure 4 and Figure 5. The series all start in 1900 except the US oil sector which, as noted earlier, begins in 1911. At its most extreme, the deviation between the market and the excluded sector is between approximately 60% and—in the USA—approximately 99.5% (for the long-short portfolio based on tobacco).

In general, this long-term perspective of analysing data from 1900 is limited by the fact that we examine only one interval of 118 years. Furthermore, it may not be feasible to maintain absence to a sector for such a long interval. We show the maximum drawdowns by sector in **Table 17**. This also includes the Tobacco, Motors and Leisure sectors for the UK which are not included in Figure 6 as they only have returns from 1920. The table provides evidence that even at 25-year periods the long short strategies can produce substantial drawdowns, so the strategy risks are not driven by any particular time period.

For the full period, in the UK, Tobacco, Oil, Alcohol, Mining, and Textiles have particularly high maximum drawdowns. In the US, this is the case for Tobacco, Chemicals, Coal, Food, Electrical Equipment, and Rail. Notably, while we saw in the earlier tables that shorting US Coal has been a profitable strategy over the full analysis period, the strategy is subject to large drawdowns over time, which may in practice make it hard for investors to continue following the strategy over a period long enough to reap any long term benefits.

Drawdowns are also substantial over different holding periods. In particular, in **Table 18** we calculate the maximum drawdowns for rolling window periods of 10, 20, and 30 years, which we shift by one year. There are 109 overlapping one-decade intervals, running from 1900-09 up to the most recent decade, 2008-17. We then take the median maximum drawdown investors would have experiences with such a holding strategy. Naturally, longer holding periods are likely to result in larger maximum drawdowns and in consequence larger historic median maximum drawdowns. In the UK, Oil, Shipping, and Mining have significantly higher

drawdowns than the mean for all rolling window periods. In the USA, this is the case for Tobacco, Textiles, and Coal. Even for sectors with lower drawdowns, these are still non-trivial and could pose difficulty for investors which are likely to face pressure from stakeholders over the exclusion strategies.

At the same time, it is important to note that these drawdowns relate to the portion of an otherwise well-diversified fund that is subject to exclusion of a sector. The impact on the total fund would involve scaling the drawdown by the proportion of the overall portfolio that is subject to sector exclusion. For example, a drawdown of –50% as a consequence of divesting a sector position that comprises 2% of the total portfolio would give rise to a shortfall in portfolio value of 1%.

We also interrogate the historical record for the returns of the long short strategies over one-decade intervals. Furthermore, similarly to the drawdown analysis, we replicate our analysis based on two-decade and three-decade intervals.

Error! Reference source not found. shows the dispersion of annualised industry returns in the UK (left-hand panel) and in the USA (right-hand panel). For each country, keeping the same sample of industries as before,[14] we calculate annualised (i.e., geometric mean) returns for one, two, and three decades of running the long-short strategy for each sector using one-year rolling windows. We then average the rolling windows of annualised returns for each sector and decade interval. Finally, we calculate the dispersion of average annualised returns per sector for each decade interval and plot relevant percentiles of the distributions.

The clusters of bars display the variation of geometric mean returns estimated over rolling windows of 10 years (in the left of each panel), 20 years (in the middle), and 30 years (in the right of each panel). Within each cluster we report the 5th and 95th percentiles, and the quartile boundaries. The numbers are displayed in **Table 19**.

Over all horizons and all sectors, and generalising across countries, the worst five percent of long-short positions had annualised returns of –1½% or less while the best five percent had annualised returns of +2% or more. The median return is close to or slightly above zero. The interquartile range is distributed around the median within an approximate range of plus or minus 1%. The range is slightly wider in the United States than in the United Kingdom, which is consistent with the larger number of industries identified in Figure 3 for the US market, as compared to the UK which has fewer industry categories (see Figure 2). It can be seen that the distribution of annualised returns from the long-short portfolio is approximately symmetric. As

[14] Which excludes Tobacco, Motors and Leisure for the UK, as they only have returns from 1920

one would expect, there is no indication of a risk premium, whether positive or negative, arising from industry exclusion.

Mean annualised returns for the rolling shorting strategies are displayed by sector in **Table 20**. For the majority of sectors, the returns of the shorting strategy are statistically significantly different from zero, especially over the longer rolling windows. In particular, for the UK, Chemicals, Alcohol, and Tobacco have significantly negative annualised returns over all horizons. Oil has significantly negative returns for the 20 and 30-year holding periods. In the USA, Oil, Electrical Equipment, Food, Chemicals, and Tobacco have significantly negative returns over all horizons.

Based on our historical evidence, shorting sectors in favour of the overall market would have been a risky strategy in the sense of introducing potentially substantial tracking error relative to the overall market or relative to standard benchmarks for performance. **Conclusion: Over a 10–30 year horizon, sector exclusion exacerbates the risk of underperformance.**

6. Further Analysis

1.3 Do Resource-company Share Prices Mimic Resource Prices?

Some investors may contemplate the exclusion of a mineral resource sector from their portfolio as a risk management measure if they are already exposed to mineral resource prices directly. This can be the case for sovereign wealth funds which are also funded by sales of fossil fuel resources. For example, the managers of the Norwegian Government Pension Fund Global (NBIM (2017)) have considered excluding the oil and gas sector from the benchmark of their portfolio for those reasons. However, resource company shares differ from direct resource ownership. Companies can manage production levels in light of output prices, extraction costs, and other factors. Even when a mine or well is undeveloped, there is a possibility that prices will become favourable in the future, and this optionality is valuable. Consequently, resource companies' shares generally sell for more than the value of the mineral minus the present value of extraction costs.

Figure 8 shows the inflation-adjusted price index for valuable mineral resources from 1900 to 2017. Only platinum outperformed cash (treasure bill returns) over the whole period, and that was due to particularly strong performance in the early 1900s. Over the period since 1900, the annualised capital appreciation for the five minerals was diamonds -0.5%, silver 0.002%, oil 0.3%, gold 0.7%, and platinum 1.4%. Over the same interval, cash (Treasury bills) provided an annualised real rate of return of 0.8%.

Historically, equities have provided a risk premium to investors. In all of the 21 markets with an unbroken history over the period 1900–2017, DMS (2018) find the long-term return on equities exceeded inflation, and also exceeded the return on long-term government bonds and the return on Treasury bills. In contrast to equities, the mineral resources plotted in **Figure 8** have almost all failed to provide a risk premium, even compared to cash, for a variety of reasons that are discussed by DMS (2018).

The low mineral resource performance is further highlighted in **Table 21**. Panel A shows the annualised real returns over the full analysis period and selected subperiods and Panel B displays the total returns for each period. The series displayed are the five mineral resources from the chart, t-bills, World equities, US Equities, US oil sector, and US mines sector. For the most recent subperiod of 2000 to 2017, all mineral resources beat cash returns. Gold, silver and oil also outperform the world equity market. In all other subperiods, however, except 1900-1924 for platinum, none of the mineral resources perform better than World or US equities.

The long-term price appreciation for minerals falls far short of the level of equity returns. It follows that investors would likely have achieved superior returns from buying into shares in resource extraction companies rather than holding the underling minerals. At the same time, however, mineral resource returns could still be related to equity returns. To investigate this, we run several regressions of the change in (the log of) mineral prices on the change in (the log of) market returns from 1911 (the base date for the US oil index) to 2017.

Our regression results are reported in **Table 22**. Panel A displays the full sample results, and the other Panels have results for the different subsamples. World and US equity market returns come from DMS (2018) and US oil and mines Sector returns come from Cowles (1938) and French (2018). Oil prices are from the BP (2018) Crude Oil Price Index. Using the inflation data in DMS (2018) we convert the total returns and price series to inflation-adjusted returns and prices. We then calculate log returns for the series in the same way we calculated log returns in the long-term returns section. The regressions are then run for these log returns series.

We choose prices to be the dependent variables in the regressions since stock market prices impound beliefs about current and future resource prices. Spot resource prices, on the other hand, are unlikely to incorporate information about future stock price fluctuations. However, the interpretation of our results does not rely on the direction of causality.

In the full sample, there is a low correlation between (logarithmic) changes in oil prices and the corresponding (logarithmic) stock market returns from investing in the US oil sector, with the regression having a negative adjusted R-squared. For the subsamples where the relationship

is statistically significant, it is in fact negative, which is the opposite direction than the expected one. The association only becomes significant after accounting for US and world market returns. However, based on the adjusted R-squared of the full model compared to the adjusted R-squared of the simple model which only includes oil sector returns, most of the explanatory power in the full model comes from including the other factors and not from oil sector returns. This suggests that oil sector stock market returns are not a suitable hedge for oil price returns.

Diamond prices are not affected by World, US, or US mines sector stock market returns. Of the other minerals, platinum is the most positively associated with world equity returns, followed by gold. All other minerals are insensitive to the world equity market returns, having no statistically significant relationships with it. Platinum, gold, and silver are positively associated with US mines sector returns. This association also holds in a simple regression which excludes World and US equity returns, suggesting the mines sector can be a partial hedge for their prices. On the other hand, the three mineral resources are negatively associated with US equity returns, similarly to oil prices. These results vary significantly in the selected subsamples (Panels B to F). In the most recent period, 2000 to 2017, silver prices are not associated with mines sector returns, while platinum and gold maintain the positive relationship. **Conclusion: World, US, and Oil market returns do not seem to provide an adequate hedge to mineral resource returns. On the other hand, mines sector returns seem to provide a partial hedge.**

1.4 Global Impact of Sector Exclusion[15]

In this section, we examine the interactions between geographic and sector allocation and the implications of sector exclusion for portfolio allocations. We use country and sector weightings data from the constituents in the FTSE All World Index in June 2018 and December 2010 (earliest available FTSE report). **Table 23** displays sector proportions in the world market, as well as for the USA, UK, Japan, Germany, and Emerging Markets. We use the ten sectors from the ICB (Industry Classification Benchmark) standard. The world index used is the FTSE Russell All World Index and is plotted as a basis for comparison with the overweight and underweight positions in the other series. Panel A displays the weights for June 2018, and Panel B, the weights in December 2010.

There are large disparities in sector weighting across regional markets. In June 2016, the USA has a particularly large allocation to technology (22%), as well as consumer services and

[15] This section is a fully-updated version of material from DMS (2015)

healthcare, all of which have higher allocations than they did in December 2010. In contrast, the UK has minimal weight in technology (1%), but is heavily tilted towards resources, with oil & gas at 16% and basic materials at 9%, which includes mining. Consumer goods are also overweight versus the world market (at 16%), and financials are high in absolute terms (21%). Technology had the same allocation in December 2010 as it did in June 2018, while oil & gas and basic materials have declined from 2010, when they made up 19% and 15% respectively. Consumer goods used to take up 12% of the UK market, which was in line with the World market. Financials, at 20% were only one percentage point (pp) lower in December 2010 relative to June 2018.

The Japanese and German markets share some similarities. Both in June 2018 and December 2010, they had substantial allocations to manufacturing industries (industrials), but very low exposures to oil & gas resources. Germany has a larger weighting to basic materials (14% in June 2018 and 19% in December 2010), which is due to the chemicals sector. Furthermore, both countries are over-exposed to consumer goods, where automobiles are the largest contributor. Japan has a low relative exposure to healthcare, and Germany to consumer services.

Emerging markets generally have a high allocation to financials at 28% in June 2018, over 60% of which is in banks. Banks made up 70% of Financials in December 2010 so they weight is decreasing. In June 2018, emerging markets are also slightly overweight in oil & gas, basic materials, and technology. They were also overweight oil & gas and basic materials in December 2010, but notably, were underweight technology. On the other hand, they are particularly under-exposed to healthcare, both in 2010 and June 2018. Furthermore, they are underweighted in consumer goods but overweighed in consumer services in June 2018, while they were underweighted in both sector in December 2010.

We proceed to compare industry concentration within individual countries. The same ICB classification used in the preceding analysis separates the ten sectors used earlier into 41 industries (for 39 of which we have country weightings). **Table 24** reports the national and sector weightings at June 2018 (Panel A) and December 2010 (Panel B).

It shows the country with the largest weight and the second-largest country, as well as their respective weights in the industry. In June 2018, the USA comprises just over half (53%) of total world market capitalisation and has the largest industry weight in 30 industries. The nine cases where the USA is not the biggest industry contributor are the following. Japan is the top player in automobiles and parts, electronic & electrical equipment, mobile telecommunications,

and construction & materials. Hong Kong leads in real estate investment & services; UK in mining; China in alternative energy; South Korea in leisure goods; and Finland in forestry and paper. In contrast, in December 2010 the USA comprised 41% of total world market capitalisation and had the largest weight in 31 industries. Japan leads in automobiles & parts and leisure goods; Hong Kong is the main contributor in real estate investment & services; UK in mining and mobile telecommunications; Finland in forestry and paper; Germany has a narrow lead over the USA in gas water & multiutilities; and France is the top country in construction & materials.

Examining industries where the weight of the second largest country is over 20%, and is not the USA, reveals other important industry players. For June 2018, Canada is an important contributor to oil equipment services & distribution; UK to tobacco; Denmark to alternative energy; Japan to leisure goods, industrial engineering, and real estate investment & services; Australia to mining; Switzerland to food producers. In December 2010, important players were UK for tobacco; Japan for support services, electronic & electrical equipment, industrial engineering; Switzerland for food producers; France for personal goods; Australia for mining; Denmark for alternative energy; Germany for chemicals.

While there are similarities between industry weights in June 2018 and December 2010, some notable trends also emerge. In 2010 the USA was the main contributor to alternative energy. In contrast, in 2018 the industry is dominated by China and Denmark. Similarly, in 2010 Japan was the leader in two industries, while in 2018 it leads in four.

To summarise, industries display pronounced country concentrations. In June 2018 (December 2010), for 31 (31) out of 39 industries, the two countries with largest weights make up over 50% of the world industry market capitalisation; for 28 (20) industries they make up more that 60%, for 18 (12) industries they make up more than 70%, and for nine (four) industries more than 80%. Furthermore, overall, industry concentration is higher in June 2018 than it was in December 2010.

In the same manner that industries appear prone to country concentration, countries can also be over-exposed to particular industries. **Table 25** displays the weight of the three largest industries in each country in June 2018 (Panel A) and December 2010 (Panel B). We have selected all countries in the FTSE All World Index in each period. In both cases we have 47 countries, 46 of which are the same. In December 2010 Qatar was in the index, while in June 2018 Morocco is included instead.

In June 2018, in four countries, three or fewer industries account for the entire country's market capitalisation, while this is the case only for two countries in December 2010. On the other hand, the five least concentrated countries in June 2018 are Japan, France, the USA, Germany and the UK, where the three largest industries make up between 25% (Japan) and 37% (UK) of total market capitalisation. In December 2010, the five least concentrated countries were South Korea, India, France, Japan, and the USA, with the three largest industries comprising between 26% and 42%. In June 2018 (December 2010), in 42 (44) out of 47 the top three industries make up more than 40% of total country market capitalisation; in 34 (35) countries, they make up at least 50%, in 23 (26) countries they make up a least 60%; and in 13 (13) at least 70%.

Therefore, there are more countries with 100% concentration made up by their top three industries in 2018 relative to 2010. However, overall, the concentration of industries among countries, while still relatively high, is slightly lower in 2018 than it was in 2010.

Our discussion highlights changes to the proportion of a county's market to which an investor is exposed. For example, if 40% of a country's stock market is taken up by a specific sector, then by excluding that sector from an investment portfolio, the portfolio's exposure to the country's market is almost halved. Another way to look at changes to country exposure would be to discuss the change of a country's weight in the total index following sector exclusion. For example, if the country made up 2% of the world market, after the sector exclusions it would comprise 1.2% of the world market (40% lower), making the exposure change roughly 0.8% (this is an approximation as the precise exposure change would depend on the new, ex-sector benchmark following exclusion). Discussed in that framework, the change to the country exposure would seem much smaller. While both approaches have merit, we stress the proportional change in country weightings to draw attention to the impact of sector divestment on exposure to emerging markets and smaller economies.

Investors who focus on specific countries will usually have poorly diversified portfolios, especially if they favour stocks located primarily in their home market. A sector-screened portfolio may be regarded as an active-passive blend of a diversified long-only portfolio plus a long-short overlay. That overlay is likely to incorporate unwanted geographic tilts alongside the sector (or other) attributes that underpin the screen. **Conclusion: sector or industry exclusion is likely to generate collateral tilts away from particular countries.**

7. Conclusion

There are a variety of motivations which can drive investors to engage in sector exclusion. These can range from beliefs about the future return prospects for particular sectors, to attempts to hedge the risks of existing holdings, or a desire to invest in line with particular ethical considerations. Over a brief horizon, exclusions are unlikely to have a large influence on prices. Atta-Darkua (2020) for example, documents that while GPFG divestment recommendations have a negative impact on the price of excluded firms, the impact is modest in magnitude. Over the long term, however, divestments are likely to have a more pronounced impact on investment returns.

In this paper we examine exclusions from the point of view of a well-diversified long-term investor. We employ a dataset of UK and USA market and sector returns starting in 1900 in order to have a long term perspective, and make periodic comparisons with global evidence. Instead of examining the performance of screened relative to non-screened portfolios, we focus our analysis on the portion of the portfolio which is being excluded and the assets which replace it. Therefore, we compare market and sector returns.

We document that over the long run sectors do not provide returns close to the market, making the overall equity market an imperfect substitute for any given sector's returns. Furthermore, sector exclusion exposes investors to substantial drawdowns in the component of the portfolio that is exposed to this strategy. The risks of screened strategies underperforming a diversified portfolio are non-trivial. Even if drawdowns are eventually reversed, investors may face pressure to abandon the sector exclusion strategies at a time when they are performing particularly poorly, thus locking in the bad performance.

We find that the equity market is a poor hedge for investors seeking to offset the price volatility of a mineral resource. Over the long term, real cash returns from equities have been higher than those from any of the high-value mineral resources which we analyse. Furthermore, from a long-term perspective, real oil prices in particular were found to be uncorrelated with real US oil sector market returns. Mines sector returns, on the other hand, seem to provide a partial hedge for platinum, gold, and silver prices, but not for the prices of diamonds.

Finally, global investors need to be mindful that sectors can be concentrated in specific geographic locations. Sector exclusions may introduce active country exposures into portfolios. Overall, our analysis suggests that in the long run the consequences of sector exclusions can be substantial rather than minor. While exclusions may generate financial rewards for an

investor, sector exclusions can also introduce unrewarded downside risks into the investor's portfolio.

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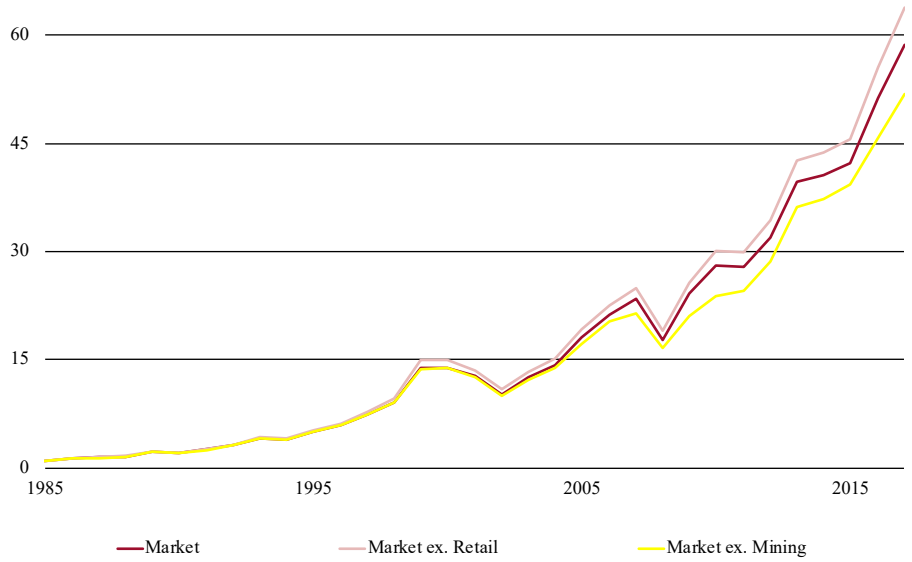
8. Figures

Figure 1 Cumulative Market returns and Market excluding a sector returns

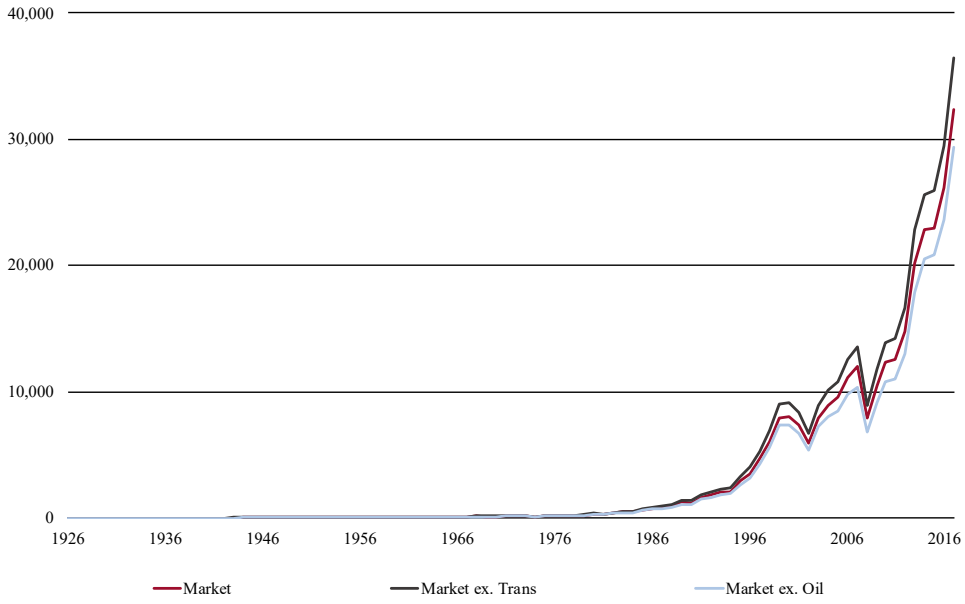
This Figure displays the cumulative returns of the total market in each geography relative to strategies which exclude a given sector and hold a market cap weighted portfolio of the remaining sectors. We plot the cumulative returns for the market and the top and bottom performing strategy in each market. Panel A shows the results in the UK market, and Panel B displays the USA market results

Panel A: UK



Thomson Reuters (2019), FTSE Russell (2019)

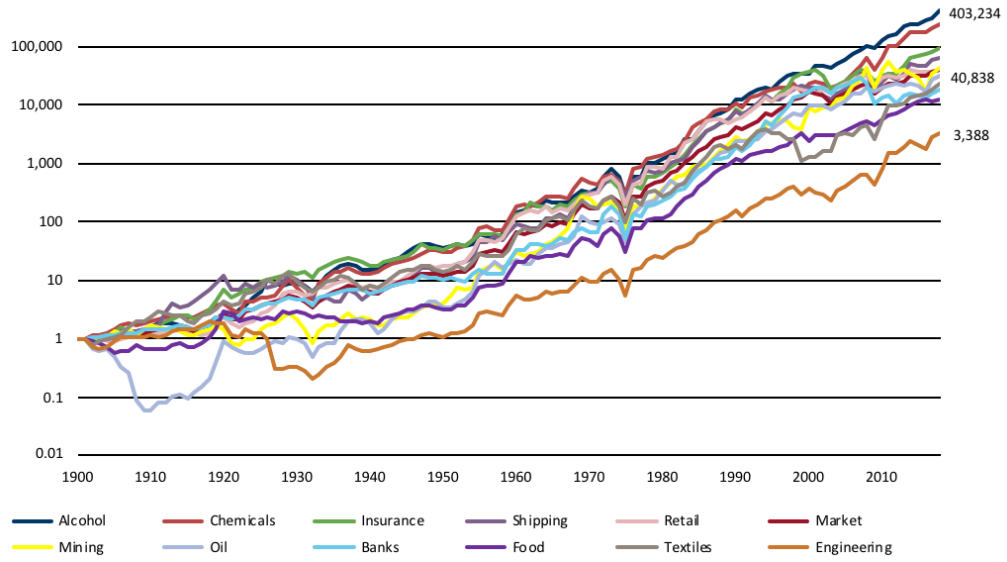
Panel B: USA



Source: French (2019)

Figure 2: Cumulative value of £1 invested in UK industries 1900–2017

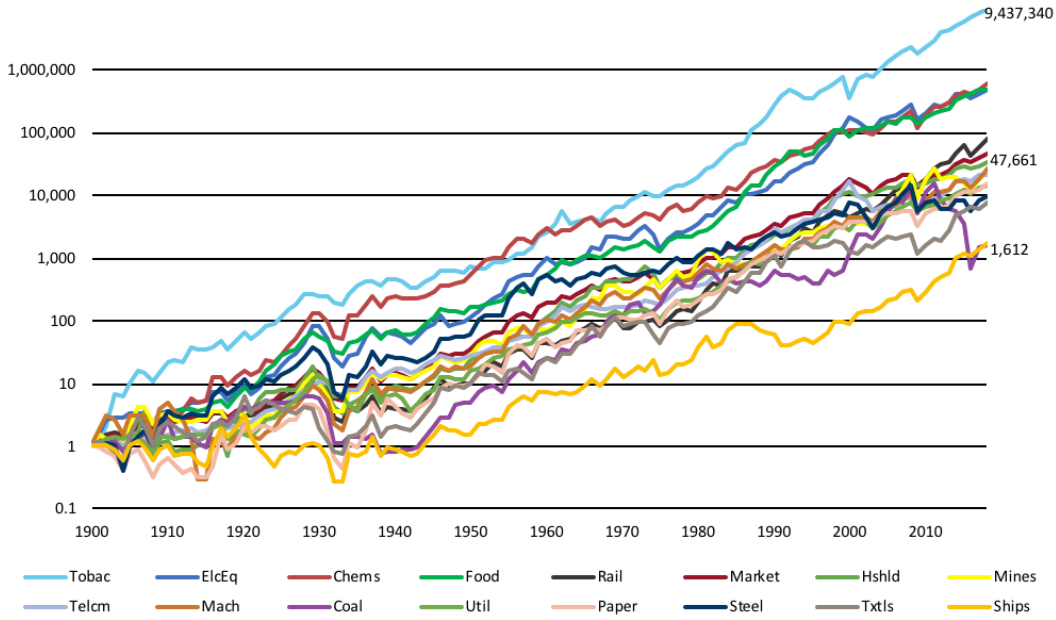
This Figure displays the cumulative returns of the UK sectors in our long term returns dataset together with the UK market return.



Source: DMS (2015), Thomson Reuters (2019)

Figure 3: Cumulative value of $1 invested in US industries 1900–2017

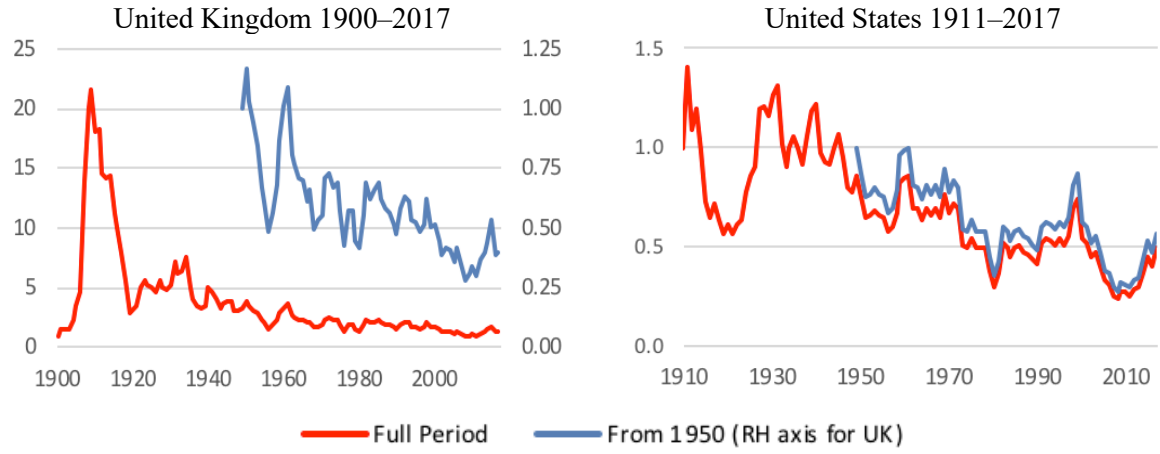
This Figure displays the cumulative returns of the USA sectors in our long term returns dataset together with the USA market return.



Source: DMS (2015), French (2019), Thomson Reuters (2019)

Figure 4: Cumulative total return for a fund long the market, short the oil sector

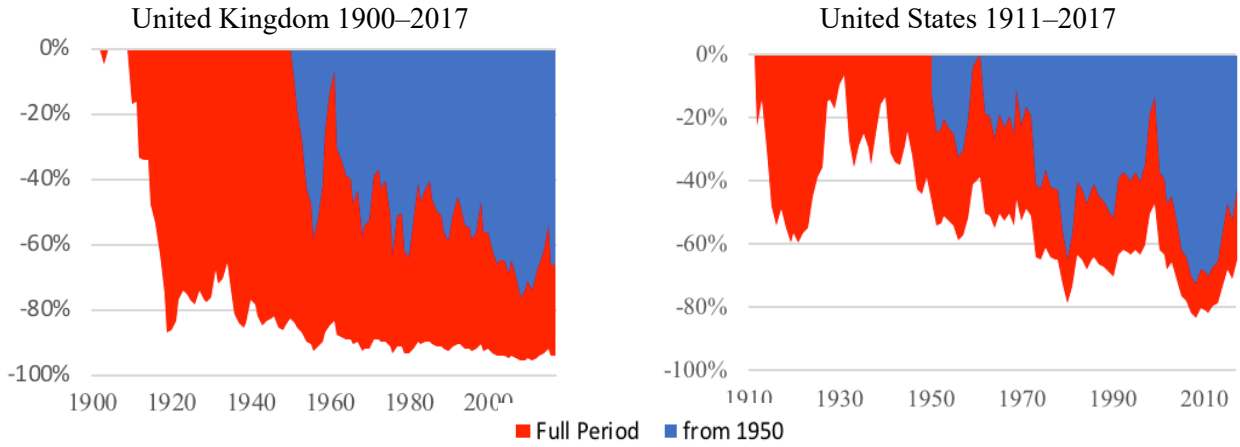
This figure shows the cumulative total returns of a strategy which is short the oil sector and long the market in the UK and USA, starting at either the beginning of the data period (1900 for the UK and 1911 for the USA) or in 1950.



Source: DMS (2015), French (2019), FTSE Russell (2019), Thomson Reuters (2019)

Figure 5: Drawdown charts for a fund long the market, short the oil sector

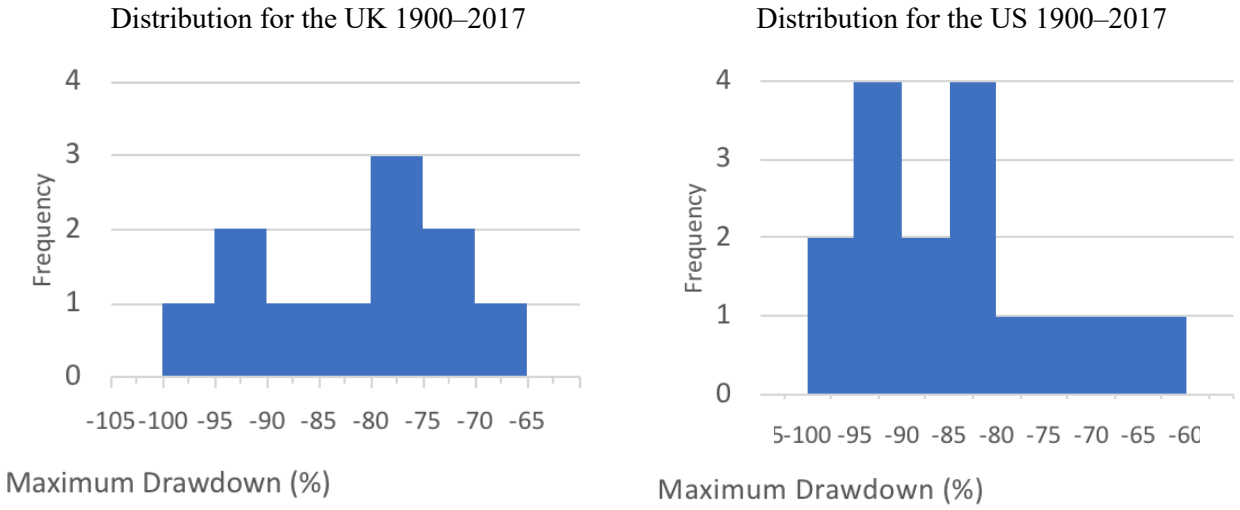
This figure shows the drawdowns of a strategy short the oil sector and long the market in the UK and USA, starting at either the beginning of the data period (1900 for the UK and 1911 for the USA) or in 1950. Drawdowns are defined as the difference between the portfolio's value on a particular date and its high-water mark (the highest historic value up to that date), divided by the high-water mark. They are expressed as percentages.



Source: DMS (2015), French (2019), FTSE Russell (2019), Thomson Reuters (2019)

Figure 6: Maximum drawdown for a fund long the market, short an industry

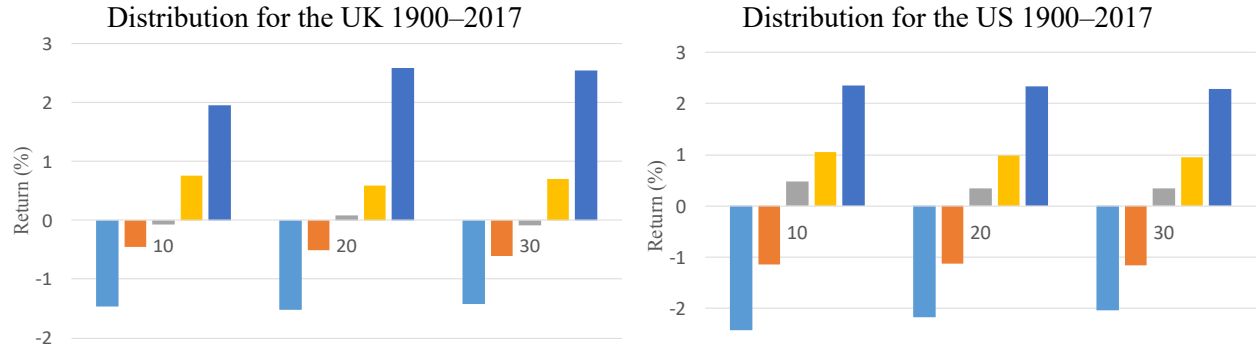
This figure shows histograms for the maximal drawdowns of portfolios short a sector and long the market in the UK and USA. Drawdowns are defined as the difference between the portfolio's value on a particular date and its high-water mark (the highest historic value up to that date), divided by the high-water mark. They are expressed as percentages. The series all start in 1900 except the US oil sector which, as noted earlier, begins in 1911.



Source: DMS (2018), French (2019), FTSE Russell (2019), Thomson Reuters (2019). Note: US oil index starts in 1911; all others in 1900.

Figure 7: Annualised return of a fund long the market, short an industry

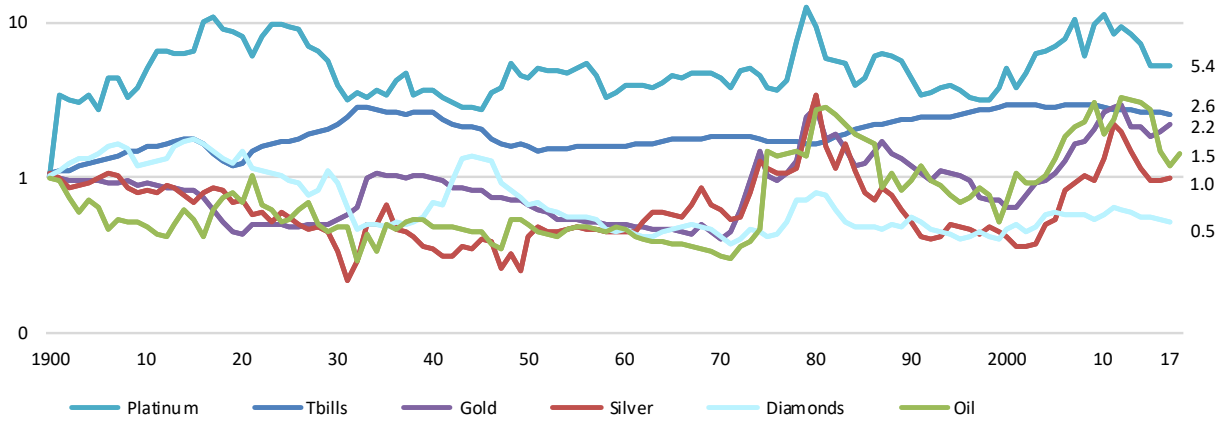
This figure shows the percentile distribution of strategies which are short a sector and long the market in the UK and USA. We use data from 1900 to 2017, and for each sector calculate the mean strategy results over one year rolling windows of 10, 20, and 30 years. The percentile distribution is then calculated based on those mean sector returns.



Source: DMS (2018), French (2019), FTSE Russell (2019), Thomson Reuters (2019).

Figure 8: Price indices for minerals in inflation-adjusted US dollars, 1900-2017

This figure shows the total real (inflation-adjusted) returns for selected minerals in US dollars.



Sources: onlygold.com (2018), Officer and Williamson (2018), US Geological Survey (2018), Stooq (2018), Katzav/IDEX (2018), Spaenjers (2016), BP (2018), DMS (2018).

9. Tables

Table 1 Return statistics for Market series and series of the Market excluding a given sector

This table displays the cumulative returns ("Total Returns", TR) of the total market in each geography relative to strategies which exclude a given sector and hold a market cap weighted portfolio of the remaining sectors. The first column "TR" shows the total returns of the strategies over the analyses period in each panel. The next column "% of Market TR" display what percentage of market total return is achieved by each strategy. The next column, "Mean" shows the mean annualised return of the strategies. In the following column. "% of Market Mean" we display the percentage of market mean annualised return achieved by each strategy. The final column, "std" shows the standard deviation of returns in each strategy. Panel A shows the results in the UK market, and Panel B displays the USA market results.

TR is Total Returns; Mean is geometric sector returns. Std is standard deviation

Panel A: UK, 1986-2017, Market value weighting, annual rebalancing

	TR	% of Market TR	Mean	% of Market Mean	Std
Retail	64	109	13.87	102	17.36
Banks	63	108	13.84	102	16.91
Insurance	60	102	13.65	101	16.97
Inds Transpt	60	102	13.63	100	16.95
Chemicals	59	101	13.60	100	16.90
Fd Producers	59	101	13.60	100	17.14
Inds Eng	59	101	13.60	100	16.89
Auto & Parts	59	100	13.57	100	16.85
Travel & Leis	59	100	13.56	100	16.95
Personal Goods	58	99	13.53	100	16.90
Oil & Gas	58	99	13.52	100	17.53
Beverages	57	98	13.49	99	17.14
Tobacco	55	94	13.34	98	17.06
Mining	52	88	13.13	97	16.22
Market	59	100	13.57	100	16.86

Source: Thomson Reuters (2019), FTSE Russell (2019)

Panel B: USA, 1927-2017, Market value weighting, annual rebalancing

	TR	% of Market TR	Mean	% of Market Mean	Std
Trans	36,347	113	12.23	101	20.60
Util	34,033	106	12.15	101	21.14
Telcm	33,975	105	12.15	101	21.13
Hshld	33,068	103	12.12	100	20.64
Steel	33,024	102	12.11	100	20.20
Chems	33,013	102	12.11	100	20.52
Mach	32,664	101	12.10	100	20.50
Paper	32,478	101	12.09	100	20.59
Ships	32,360	100	12.09	100	20.53
Food	32,304	100	12.09	100	20.86
Txtls	32,280	100	12.09	100	20.56
Coal	32,270	100	12.08	100	20.58
Mines	32,155	100	12.08	100	20.56
ElcEq	31,876	99	12.07	100	20.49
Smoke	30,997	96	12.04	100	20.80
Oil	29,340	91	11.97	99	20.99
Market	32,249	100	12.08	100	20.57

French (2019)

Table 2: Sector market capitalisations in the United Kingdom

This table shows the composition of the UK Market in the beginning of our long term returns sample (1900) and its composition at the end of our sample (2018)

Panel A: 1st January 1900

Sector	%
Rail	49.2
Banks	15.4
Mines	6.7
Textiles	4.8
Iron & coal	4.5
Drink	4.5
Other industrial	3.6
Utilities	3.1
Telegraph	2.5
Insurance	1.9
Other transport	1.4
Retail	0.7
Food	0.6
Media	0.3
Oil & gas	0.2

Panel B: 1st January 2018

Sector	%
Other industrial	16.4
Oil & gas	15.0
Banks	13.1
Health	8.8
Mines	7.4
Tobacco	7.0
Insurance	5.7
Telecoms	4.2
Travel & leisure	3.8
Other financial	3.6
Media	3.5
Drink	3.5
Utilities	3.1
Retail	2.8
Technology	0.9
Food	0.6
Textiles	0.4
Other transport	0.2

Source: DMS (2002, 2018), FTSE Russell (2019)

Table 3: Sector market capitalisations in the United States

This table shows the composition of the USA Market in the beginning of our long term returns sample (1900) and its composition at the end of our sample (2018)

Panel A: 1st January 1900

Sector	%
Rail	62.8
Banks	6.7
Other Industrial	5.3
Iron & coal	5.2
Utilities	4.8
Tobacco	4.0
Telegraph	3.9
Other transport	3.7
Food	2.5
Textiles	0.7
Drink	0.3
Retail	0.1

Panel B: 1st January 2018

Sector	%
Technology	20.2
Other industrial	16.7
Health	12.7
Banks	7.9
Retail	7.3
Other financial	7.2
Oil & gas	5.9
Insurance	4.4
Media	3.0
Utilities	2.9
Travel & leisure	2.6
Telecoms	2.1
Drinks	2.0
Food	1.6
Tobacco	1.3
Rail	0.9
Other transport	0.8
Textiles	0.3
Others	0.3

Source: DMS (2002, 2018), FTSE Russell (2019)

Table 4 Geometric Mean Returns for Sectors and the Market

This table shows the geometric mean annualised returns for the sectors and the market in the UK (Panel A) and USA (Panel B). The annualised returns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years.

Panel A: UK, 1900-2017

*Tobacco, Motors, and Leisure start in 1920

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobacco*	13.46		4.81	8.44	22.66	19.89
Alcohol	11.56	7.85	7.03	8.57	21.09	14.78
Chemicals	11.06	6.68	7.42	9.57	19.10	13.72
Insurance	10.20	9.58	4.92	7.09	23.51	5.63
Shipping	9.86	9.00	1.27	13.42	18.74	6.79
Leisure*	9.74		-0.61	7.83	21.98	8.87
Mining	9.48	1.44	4.07	12.65	20.93	9.33
Retail	9.36	4.08	7.62	10.31	19.60	4.48
Oil	9.16	-1.47	6.78	10.82	24.02	6.45
Textiles	8.86	8.35	2.54	8.05	10.76	17.48
Banks	8.65	5.35	4.15	6.94	25.67	0.46
Food	8.32	3.06	1.78	9.21	19.21	9.58
Motors*	7.94		5.28	6.12	22.98	5.72
Engineering	7.13	0.87	-0.72	6.87	18.48	12.94
Market	9.41	5.30	4.82	9.20	22.5	4.99

Panel B: US, 1900-2017

*Oil starts in 1911

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobac	14.58	20.64	8.00	10.89	15.52	19.81
Chems	11.97	14.29	12.46	8.51	14.19	9.96
ElcEq	11.74	12.51	7.41	10.45	21.60	5.64
Food	11.73	14.06	7.54	8.50	18.44	9.99
Oil*	10.40		6.52	11.9	15.19	8.22
Rail	10.07	7.16	2.42	8.84	17.24	17.46
Hshld	9.25	8.78	4.22	11.34	15.25	6.08
Mach	9.01	4.21	8.04	10.2	12.64	10.58
Mines	8.85	5.88	7.92	10.54	10.03	10.35
Telcm	8.81	6.24	7.47	7.93	19.63	1.49
Paper	8.54	2.86	6.66	9.25	15.97	8.29
Util	8.46	5.39	5.97	7.78	14.10	9.60
Steel	8.13	11.05	6.21	9.34	10.96	1.45
Txtls	7.87	5.60	3.94	5.91	14.61	10.30
Ships	6.50	-1.51	3.36	8.97	7.95	17.61
Coal	6.46	6.45	0.11	15.65	7.52	1.95
Market	9.56	7.83	6.97	9.43	17.11	5.73

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 5 Callan Periodic Tables for Geometric Mean Returns for Sectors and the Market

This table shows Callan tables for the geometric mean annualised returns for the sectors and the market in the UK (Panel A) and USA (Panel B). The annualised returns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. Callan tables rank each sector and the market from the highest to lowest return in each period.

Panel A: UK, 1900-2017

*Tobacco, Motors, and Leisure start in 1920

1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobacco* 13.46	Insurance 9.58	Retail 7.62	Shipping 13.42	Banks 25.67	Tobacco 19.89
Alcohol 11.56	Shipping 9.00	Chemicals 7.42	Mining 12.65	Oil 24.02	Textiles 17.48
Chemicals 11.06	Textiles 8.35	Alcohol 7.03	Oil 10.82	Insurance 23.51	Alcohol 14.78
Insurance 10.20	Alcohol 7.85	Oil 6.78	Retail 10.31	Motors 22.98	Chemicals 13.72
Shipping 9.86	Chemicals 6.68	Motors 5.28	Chemicals 9.57	Tobacco 22.66	Engineering 12.94
Leisure* 9.74	Banks 5.35	Insurance 4.92	Food 9.21	Market 22.50	Food 9.58
Mining 9.48	Market 5.30	Market 4.82	Market 9.20	Leisure 21.98	Mining 9.33
Market 9.41	Retail 4.08	Tobacco 4.81	Alcohol 8.57	Alcohol 21.09	Leisure 8.87
Retail 9.36	Food 3.06	Banks 4.15	Tobacco 8.44	Mining 20.93	Shipping 6.79
Oil 9.16	Mining 1.44	Mining 4.07	Textiles 8.05	Retail 19.60	Oil 6.45
Textiles 8.86	Engineering 0.87	Textiles 2.54	Leisure 7.83	Food 19.21	Motors 5.72
Banks 8.65	Oil -1.47	Food 1.78	Insurance 7.09	Chemicals 19.10	Insurance 5.63
Food 8.32		Shipping 1.27	Banks 6.94	Shipping 18.74	Market 4.99
Motors* 7.94		Leisure -0.61	Engineering 6.87	Engineering 18.48	Retail 4.48
Engineering 7.13		Engineering -0.72	Motors 6.12	Textiles 10.76	Banks 0.46

Panel B: US, 1900-2017
*Oil starts in 1911

1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobac 14.58	Tobac 20.64	Chems 12.46	Coal 15.65	ElcEq 21.60	Tobac 19.81
Chems 11.97	Chems 14.29	Mach 8.04	Oil 11.90	Telcm 19.63	Ships 17.61
ElcEq 11.74	Food 14.06	Tobac 8.00	Hshld 11.34	Food 18.44	Rail 17.46
Food 11.73	ElcEq 12.51	Mines 7.92	Tobac 10.89	Rail 17.24	Mach 10.58
Oil* 10.40	Steel 11.05	Food 7.54	Mines 10.54	Market 17.11	Mines 10.35
Rail 10.07	Hshld 8.78	Telcm 7.47	ElcEq 10.45	Paper 15.97	Txtls 10.30
Market 9.56	Market 7.83	ElcEq 7.41	Mach 10.20	Tobac 15.52	Food 9.99
Hshld 9.25	Rail 7.16	Market 6.97	Market 9.43	Hshld 15.25	Chems 9.96
Mach 9.01	Coal 6.45	Paper 6.66	Steel 9.34	Oil 15.19	Util 9.60
Mines 8.85	Telcm 6.24	Oil 6.52	Paper 9.25	Txtls 14.61	Paper 8.29
Telcm 8.81	Mines 5.88	Steel 6.21	Ships 8.97	Chems 14.19	Oil 8.22
Paper 8.54	Txtls 5.60	Util 5.97	Rail 8.84	Util 14.10	Hshld 6.08
Util 8.46	Util 5.39	Hshld 4.22	Chems 8.51	Mach 12.64	Market 5.73
Steel 8.13	Mach 4.21	Txtls 3.94	Food 8.50	Steel 10.96	ElcEq 5.64
Txtls 7.87	Paper 2.86	Ships 3.36	Telcm 7.93	Mines 10.03	Coal 1.95
Ships 6.50	Ships -1.51	Rail 2.42	Util 7.78	Ships 7.95	Telcm 1.49
Coal 6.46		Coal 0.11	Txtls 5.91	Coal 7.52	Steel 1.45

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 6: Cumulative value of £1 invested in UK industries 1900–2017

This table shows the cumulative returns for the sectors and the market in the UK (Panel A) and the relative size of those cumulative returns to the UK market return (sector total return divided by market total return, Panel B). These are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years.

Panel A: Total Returns for Sectors and the Market

*Tobacco, Motors, and Leisure start in 1920

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Alcohol	403,234	6.61	5.47	7.81	119.62	11.95
Chemicals	237,221	5.04	5.99	9.82	79.08	10.12
Tobacco*	237,087		3.24	7.59	165.03	26.19
Insurance	95,066	9.84	3.32	5.54	195.95	2.68
Shipping	65,786	8.62	1.37	23.31	73.21	3.26
Mining	43,938	1.43	2.71	19.65	115.62	4.98
Retail	38,333	2.72	6.28	11.63	87.79	2.2
Oil	31,078	0.69	5.15	13.05	217.22	3.08
Textiles	22,510	7.42	1.87	6.93	12.86	18.17
Banks	17,866	3.68	2.76	5.35	302.54	1.09
Food	12,520	2.13	1.55	9.04	80.82	5.19
Leisure*	9,067		0.86	6.59	143.6	4.61
Engineering	3,388	1.24	0.84	5.26	69.33	8.94
Motors*	1,789		3.62	4.41	176.1	2.72
Market	40,838	3.64	3.24	9.02	159.75	2.4

Panel B: Relative Returns for Sectors vs the Market

*Tobacco, Motors, and Leisure start in 1920

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobacco*	15.85		1.00	0.84	1.03	10.91
Alcohol	9.87	1.81	1.69	0.87	0.75	4.98
Chemicals	5.81	1.38	1.85	1.09	0.5	4.21
Insurance	2.33	2.7	1.03	0.61	1.23	1.12
Shipping	1.61	2.37	0.42	2.58	0.46	1.36
Mining	1.08	0.39	0.84	2.18	0.72	2.07
Retail	0.94	0.75	1.94	1.29	0.55	0.92
Oil	0.76	0.19	1.59	1.45	1.36	1.28
Leisure*	0.61		0.26	0.73	0.9	1.92
Textiles	0.55	2.04	0.58	0.77	0.08	7.56
Banks	0.44	1.01	0.85	0.59	1.89	0.45
Food	0.31	0.58	0.48	1.00	0.51	2.16
Motors*	0.12		1.12	0.49	1.10	1.13
Engineering	0.08	0.34	0.26	0.58	0.43	3.72

Source: DMS (2015), Thomson Reuters (2019), FTSE Russell (2019)

Table 7: Cumulative value of $1 invested in US industries 1900–2017

This table shows the cumulative returns for the sectors and the market in the USA (Panel A) and the relative size of those cumulative returns to the USA market return (sector total return divided by market total return, Panel B). These are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years.

Panel A: Total Returns for Sectors and the Market

*Oil starts in 1911

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobac	9,437,340	108.88	6.86	13.25	36.85	25.89
Chems	623,092	28.18	18.83	7.70	27.60	5.53
ElcEq	488,153	19.06	5.98	12.01	132.98	2.68
Food	484,231	26.79	6.16	7.69	68.77	5.55
Rail	82,254	5.63	1.82	8.31	53.3	18.12
Oil*	39,523		4.85	16.61	34.3	4.14
Hshld	34,000	8.21	2.81	14.66	34.78	2.89
Mach	26,350	2.80	6.91	11.34	19.59	6.12
Mines	22,092	4.17	6.72	12.26	10.92	5.89
Telcm	21,342	4.54	6.05	6.74	88.34	1.31
Paper	15,769	2.02	5.01	9.13	40.57	4.19
Util	14,538	3.71	4.27	6.51	27.07	5.21
Steel	10,087	13.75	4.51	9.31	13.47	1.30
Txtls	7,593	3.90	2.63	4.20	30.22	5.84
Ships	1,679	0.68	2.28	8.57	6.77	18.55
Coal	1,612	4.77	1.03	37.89	6.13	1.42
Market	47,661	6.58	5.39	9.51	51.85	2.73

Panel B: Relative Returns for Sectors vs the Market

*Oil starts in 1911

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobac	198.01	16.55	1.27	1.39	0.71	9.50
Chems	13.07	4.28	3.49	0.81	0.53	2.03
ElcEq	10.24	2.9	1.11	1.26	2.56	0.98
Food	10.16	4.07	1.14	0.81	1.33	2.04
Oil*	2.04		0.9	1.75	0.66	1.52
Rail	1.73	0.86	0.34	0.87	1.03	6.65
Hshld	0.71	1.25	0.52	1.54	0.67	1.06
Mach	0.55	0.43	1.28	1.19	0.38	2.24
Mines	0.46	0.63	1.25	1.29	0.21	2.16
Telcm	0.45	0.69	1.12	0.71	1.70	0.48
Paper	0.33	0.31	0.93	0.96	0.78	1.54
Util	0.31	0.56	0.79	0.68	0.52	1.91
Steel	0.21	2.09	0.84	0.98	0.26	0.48
Txtls	0.16	0.59	0.49	0.44	0.58	2.14
Ships	0.04	0.10	0.42	0.90	0.13	6.80
Coal	0.03	0.72	0.19	3.98	0.12	0.52

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 8: Sector Correlations with the Market

This table shows the correlations with the overall market for the sectors in the UK (Panel A) and in the USA (Panel B). Correlations are calculated using log returns. The metrics are tested for significance relative to the mean in each period. These are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Log returns for year are calculated as: $Return_t = \ln (TR_t / TR_{t-1})$, where TR_t is the value of a cumulative return series at year t.

Panel A: UK, 1900-2017

*Tobacco, Motors, and Leisure start in 1920.

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Insurance	0.87***	0.79***	0.83**	0.88	0.89***	0.87**
Banks	0.85***	0.70	0.90***	0.86**	0.86**	0.81
Chemicals	0.84***	0.81***	0.81**	0.93***	0.83	0.84*
Leisure^	0.84***		0.67	0.90	0.92***	0.84*
Retail	0.82**	0.80***	0.63	0.88	0.80	0.81
Motors^	0.79		0.66	0.91	0.82	0.86**
Alcohol	0.77	0.43***	0.72	0.90	0.74	0.73
Food	0.76	0.52***	0.39***	0.94***	0.83*	0.55***
Shipping	0.75	0.62	0.63	0.84***	0.72*	0.94***
Engineering	0.75	0.63	0.38***	0.98***	0.86***	0.88**
Mining	0.74*	0.64	0.88***	0.86**	0.59***	0.69
Textiles	0.70***	0.76**	0.66	0.91	0.69***	0.69
Oil	0.69***	0.50***	0.82**	0.84***	0.76	0.62*
Tobacco^	0.67***		0.87***	0.85***	0.58***	0.15***
Mean	0.78	0.65	0.70	0.89	0.78	0.74

Panel B: US, 1900-2017

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
ElcEq	0.89***	0.84***	0.92**	0.86***	0.88***	0.92***
Chems	0.85***	0.85***	0.92**	0.84**	0.74***	0.92***
Steel	0.83***	0.84***	0.95***	0.79	0.51*	0.90***
Rail	0.79*	0.90***	0.93**	0.80	0.56	0.67*
Oil^	0.78		0.89	0.80	0.63	0.68
Mach	0.77	0.78	0.97***	0.94***	0.65	0.90***
Paper	0.77	0.66***	0.87	0.79	0.74***	0.92***
Food	0.77	0.85***	0.95***	0.76	0.50**	0.60***
Txtls	0.77	0.78	0.82**	0.84**	0.54	0.80
Mines	0.75	0.77	0.93***	0.70	0.52	0.77
Telcm	0.74	0.81*	0.82**	0.67**	0.51*	0.86**
Ships	0.72	0.74	0.89	0.69*	0.53	0.76
Util	0.71	0.76	0.72***	0.77	0.64	0.64**
Hshld	0.67**	0.60***	0.89	0.85***	0.77***	0.84*
Coal	0.55***	0.73	0.75***	0.45***	0.61	0.42***
Tobac	0.48***	0.59***	0.78***	0.50***	0.10***	0.43***
Mean	0.74	0.77	0.88	0.75	0.59	0.75

Significance levels: * p<0.1, ** p<0,05, ***p <0.01 Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 9: Sector and Market Standard Deviations

This table shows the standard deviations of the overall market and sectors in the UK (Panel A) and in the USA (Panel B). Standard Deviations are calculated for log returns. Standard deviations are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. Log returns for year t are calculated as: $Return_t = \ln (TR_t / TR_{t-1})$, Where TR_t is the value of a cumulative return series at year t.

Panel A: UK, 1900-2017

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^	36***		32**	34	29*	39*
Leisure^	29***		28**	35	25	24
Mining	29***	19**	23	33	25	41***
Oil	29***	38***	26**	29	24	17
Engineering	26**	17	30	24	24	29**
Textiles	26***	17**	19*	26	34**	29
Shipping	23***	21**	21*	24	18	30
Banks	22	8	11	30	23	26
Tobacco^	22		15	23	28**	12
Chemicals	21	13	20	25	24	23
Insurance	21	15	14	25	22	22
Retail	21	14	15	27	24*	17
Food	20	19**	11	26	22	11
Alcohol	19	13	17	26	19	12
Market	18	10	13	24	18	17

Panel B: US, 1900-2017

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Coal	37***	34**	34	26*	26***	65***
Mach	36***	62***	35	22	16	27
Paper	33***	43***	46**	26*	14	21
Txtls	32***	40***	36	30***	25***	27
Steel	32***	39**	37	25	18	38**
Ships	31***	39***	39	25	23**	21
Hshld	29*	52**	27	22	13	12
Mines	28***	30*	28	23	22**	39**
ElcEq	24**	21	32	24	15	24
Tobac	24	32**	19	20	24	19
Rail	24*	17	32	23	22***	19
Chems	23	28	29	19	15	24
Oil^	21		26	19	17	20
Util	21	23	30	14	13	19
Food	18	21	20	15	18*	11
Telcm	17	12*	18*	12	15	25
Market	19	18	26	18	12	20

Levene Test for differences in variances of sectors vs the market, at median, * p<0.1, ** p<0,05, ***p <0.01;
Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 10: Sector Betas vs the Market

This table shows the betas for each sector and mean sector beta in the UK (Panel A) and in the USA (Panel B). Betas are created using log returns. The metrics are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Betas are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. Log returns for year t are calculated as: $Return_t = \ln (TR_t / TR_{t-1})$, Where TR_t is the value of a cumulative return series at year t.

Panel A: UK, 1900-2017

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^	1.48***		1.59***	1.28***	1.29***	1.97***
Leisure^	1.25***		1.38***	1.31***	1.26***	1.20
Mining	1.17***	1.15	1.54***	1.16***	0.83***	1.69***
Oil	1.09***	1.81***	1.57***	1.01	0.99	0.63***
Engineering	1.06*	1.02	0.88	0.98	1.13*	1.49**
Banks	1.04	0.52***	0.76**	1.07	1.08	1.23
Chemicals	1.00	1.00	1.24*	0.94*	1.09	1.16
Textiles	0.99	1.22	0.93	0.99	1.30***	1.18
Insurance	0.99	1.17	0.86*	0.90***	1.09	1.16
Shipping	0.96	1.22	0.97	0.85***	0.72***	1.68***
Retail	0.93	1.11	0.70***	0.98	1.04	0.82*
Food	0.83***	0.97	0.32***	1.01	1.01	0.36***
Alcohol	0.80***	0.55***	0.92	0.96	0.78***	0.50***
Tobacco^	0.75***		1.00	0.82***	0.87***	0.11***
Mean	0.99	1.07	1.05	1.02	1.03	1.08

Panel B: US, 1900-2017

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Mach	1.46***	2.65***	1.32***	1.18***	0.88	1.25**
Steel	1.38***	1.81***	1.36***	1.12***	0.78	1.74***
Paper	1.32***	1.56	1.57***	1.14***	0.86	0.98
Txtls	1.28***	1.75**	1.15	1.40***	1.13***	1.11
Ships	1.17*	1.60*	1.35***	0.96	1.02**	0.81
ElcEq	1.12	0.99**	1.15	1.18***	1.09***	1.12
Mines	1.09	1.27	1.03	0.90	0.96	1.51***
Coal	1.08	1.37	0.99	0.66***	1.33***	1.41***
Chems	1.04	1.33	1.03	0.89	0.94	1.13
Hshld	1.03	1.71**	0.94	1.05*	0.83	0.51***
Rail	0.97	0.82***	1.15	1.03	1.06**	0.64***
Oil^	0.88*		0.89**	0.85	0.91	0.68**
Util	0.77***	0.94***	0.85**	0.59***	0.73**	0.61***
Food	0.71***	0.98**	0.74***	0.65***	0.75**	0.35***
Telcm	0.66***	0.55***	0.57***	0.47***	0.66***	1.09
Tobac	0.59***	1.05**	0.57***	0.57***	0.21***	0.42***
Mean	1.05	1.36	1.04	0.92	0.88	0.96

Significance levels: * p<0.1, ** p<0,05, ***p <0.01

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 11: Tracking Errors for Sectors vs Market, UK ,1900-2017

This table shows two different metrics of UK sector tracking errors relative to the UK market. Panel A calculates tracking errors as the mean absolute deviations from market returns and Panel B uses the standard deviation of the variance of the difference of sector and market (formula shown below). The metrics are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Tracking errors are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years.

Panel A: Mean Absolute Deviation

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^	0.18***		0.19***	0.14**	0.19***	0.20***
Oil	0.17***	0.25***	0.14**	0.16***	0.16	0.13
Mining	0.17***	0.11	0.11	0.17***	0.19***	0.30***
Tobacco^	0.15**		0.06***	0.12	0.23***	0.20**
Leisure^	0.14		0.15***	0.14***	0.12**	0.13
Textiles	0.14**	0.09	0.12	0.10*	0.19***	0.21***
Shipping	0.13	0.12	0.14**	0.12	0.14	0.12*
Alcohol	0.11	0.11	0.10	0.11	0.14	0.11**
Food	0.11	0.14	0.11	0.08***	0.10***	0.12*
Engineering	0.10*	0.10	0.11	0.05***	0.11***	0.16
Retail	0.10*	0.07**	0.09	0.11	0.15	0.08***
Chemicals	0.10**	0.06**	0.10	0.08***	0.13	0.13
Banks	0.09**	0.05***	0.05***	0.14*	0.12**	0.11**
Insurance	0.09**	0.09	0.07***	0.11	0.10***	0.10***
Mean	0.12	0.11	0.11	0.12	0.15	0.15

Panel B: Standard-Deviation based

TE = Sqrt (Sum((R_Sector – R_market) ^2)/ (n-1))

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^	0.27***		0.33***	0.18	0.26***	0.29***
Mining	0.24***	0.15	0.13	0.23***	0.29***	0.39***
Oil	0.24***	0.36***	0.18	0.21***	0.21	0.16*
Leisure^	0.21**		0.24***	0.23***	0.20	0.16*
Tobacco^	0.21*		0.08***	0.16	0.30***	0.26**
Textiles	0.20**	0.13	0.15	0.13*	0.25***	0.33***
Shipping	0.18	0.19	0.18	0.16	0.20	0.16*
Engineering	0.16	0.14	0.20**	0.06***	0.15***	0.25*
Alcohol	0.15	0.15	0.14	0.13	0.18	0.15**
Food	0.15	0.20*	0.15	0.10***	0.14***	0.15**
Chemicals	0.14*	0.09**	0.16	0.10***	0.17**	0.19
Retail	0.14**	0.10**	0.14	0.14	0.18	0.11***
Banks	0.14**	0.08**	0.06***	0.19**	0.16**	0.14**
Insurance	0.12***	0.12	0.08***	0.15	0.13***	0.11***
Mean	0.17	0.15	0.16	0.16	0.20	0.20

Significance levels: * p<0.1, ** p<0,05, ***p <0.01; Source: DMS (2015), Thomson Reuters (2019), FTSE Russell (2019)

Table 12: Tracking Errors for Sectors vs Market, US ,1900-2017

This table shows two different metrics of US sector tracking errors relative to the US market. Panel A calculates tracking errors as the mean absolute deviations from market returns and Panel B uses the standard deviation of the variance of the difference of sector and market (formula shown below). The metrics are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Tracking errors are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years.

Panel A: Mean Absolute Deviation

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Coal	0.25***	0.21	0.19***	0.20***	0.22***	0.48***
Txtls	0.19***	0.26**	0.15*	0.17***	0.19***	0.14
Ships	0.18***	0.25	0.18***	0.13	0.19***	0.15
Paper	0.18**	0.30***	0.24***	0.15**	0.09***	0.07***
Tobac	0.17*	0.24	0.12	0.15***	0.17**	0.18
Mach	0.17	0.43***	0.10**	0.07***	0.10***	0.12
Mines	0.16	0.17	0.09***	0.14**	0.16*	0.26***
Steel	0.16	0.21	0.12	0.14*	0.15	0.17
Hshld	0.14	0.33***	0.11**	0.11**	0.07***	0.08**
Rail	0.12**	0.05***	0.10**	0.13	0.18***	0.17
Oil^	0.12**		0.11**	0.10***	0.12	0.14
Util	0.12***	0.12***	0.15*	0.10***	0.09***	0.13
Telcm	0.11***	0.10***	0.13	0.11*	0.13	0.10**
Food	0.11***	0.12***	0.07***	0.10***	0.14	0.12
Chems	0.11***	0.14**	0.11	0.08***	0.09***	0.09**
ElcEq	0.10***	0.11***	0.11	0.12	0.08***	0.08***
Mean	0.15	0.20	0.13	0.12	0.14	0.16

Panel B: Standard-Deviation based

TE = Sqrt (Sum((R_Sector – R_market) ^2)/ (n-1))

*Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Mach	0.38***	0.80***	0.14**	0.09***	0.14**	0.15*
Coal	0.33***	0.29	0.24**	0.26***	0.26***	0.59***
Paper	0.31***	0.52***	0.39***	0.18**	0.11***	0.09***
Tobac	0.30***	0.50***	0.17	0.21***	0.24***	0.31***
Hshld	0.29**	0.59***	0.14**	0.13**	0.10***	0.11***
Ships	0.26	0.33	0.31***	0.20***	0.23***	0.21
Txtls	0.25	0.39	0.21	0.19**	0.24***	0.20
Steel	0.23	0.34	0.18	0.18	0.19	0.21
Mines	0.22	0.24	0.13**	0.18**	0.21**	0.34***
Chems	0.17***	0.26	0.19	0.10***	0.12***	0.12**
Util	0.17***	0.15***	0.23**	0.13**	0.12***	0.19
Rail	0.16***	0.09***	0.13***	0.15	0.22***	0.19
Oil^	0.16***		0.14**	0.13***	0.16	0.17
Food	0.14***	0.15***	0.10***	0.13**	0.18	0.16
Telcm	0.14***	0.12***	0.16	0.15	0.17	0.12**
ElcEq	0.13***	0.15***	0.16	0.15	0.10***	0.10***
Mean	0.23	0.33	0.19	0.16	0.18	0.21

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 13: Rolling Mean Annualised Returns for Sectors and the Market ,1900-2017

This table rolling annualized (i.e. geometric mean) returns for each sector and the market over 10, 20 and 30-year periods, with a one year rolling window. The results in Panel A are for the UK, and in Panel B for the USA. The metrics are tested for significance relative to the market rolling annualised mean in each geography.

Panel A: UK

^Tobacco, Motors, and Leisure start in 1920

Industry\Period	10	20	30
Tobacco^	13.68***	13.47**	13.60*
Alcohol	11.93**	12.11***	12.23***
Chemicals	11.20*	11.09	11.40
Oil	11.07	12.08**	12.30***
Insurance	10.42	10.76	10.80
Shipping	10.22	10.19	10.34
Retail	10.20	10.74	11.19
Mining	10.19	10.45	10.87
Motors^	9.68	10.37	10.81**
Leisure^	9.35	9.92*	10.62*
Banks	9.30	10.13	10.26
Food	9.18	9.47	9.56
Textiles	8.95	8.40***	8.55***
Engineering	7.49**	7.05***	7.40***
Market	9.87	10.36	10.63

Test for Significance of Sector vs Market returns * p<0.1, ** p<0,05, ***p <0.01

Panel B: USA

^Oil starts in 1911

Industry\Period	10	20	30
Tobac	13.47***	12.93***	12.81***
Chems	12.01***	11.92***	11.75***
Food	11.96***	12.07***	11.97***
ElcEq	11.56***	11.89***	11.71***
Oil	10.98	11.06*	11.47***
Rail	9.81	9.56	9.48
Hshld	9.69	10.21	9.98
Paper	9.28	9.78	9.82
Telcm	9.05	9.42	9.63
Mines	8.82	8.84*	8.97**
Util	8.74	8.95	9.03**
Steel	8.60	8.54**	8.39***
Coal	8.54	8.54	8.08**
Mach	8.52	9.03	9.26
Txtls	7.85	7.85***	8.06***
Ships	6.54***	6.28***	6.20***
Market	9.46	9.77	9.85

Test for Significance of Sector vs Market returns * p<0.1, ** p<0,05, ***p <0.01

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 14: Annualised Returns for a Strategy Long the Market and Short Sectors

This table shows the annualised returns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B). The annualised returns are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Returns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. The formula used to calculate the returns of the strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$

Panel A: UK, 1900-2017

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^	2.19***		-0.44	2.90***	-0.39**	-0.69**
Engineering	2.13***	4.39***	5.57***	2.18***	3.40*	-7.04**
Food	1.01**	2.18	2.98**	-0.01	2.76	-4.19
Banks	0.70*	-0.04	0.64	2.11***	-2.52***	4.51***
Leisure^	0.51		5.46***	1.26*	0.43	-3.56
Textiles	0.51	-2.81**	2.22*	1.06	10.60***	-10.63***
Oil	0.23	6.87***	-1.84***	-1.47***	-1.22***	-1.37**
Retail	0.05	1.17	-2.61***	-1.01**	2.42	0.49***
Mining	-0.06	3.81**	0.71	-3.07***	1.30	-3.97
Shipping	-0.40	-3.39***	3.50***	-3.73***	3.17*	-1.68*
Insurance	-0.71*	-3.90***	-0.10	1.97***	-0.81**	-0.61**
Chemicals	-1.48***	-1.29	-2.43***	-0.34	2.85	-7.68**
Alcohol	-1.92***	-2.36**	-2.07***	0.58	1.16	-8.53***
Tobacco^	-2.78***		0.00	0.69	-0.13*	-12.43***
Mean	0.00	0.42	0.83	0.22	1.64	-4.10

Panel B: US, 1900-2017

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Coal	2.91***	1.30	6.85***	-5.38***	8.91***	3.71***
Ships	2.88***	9.48***	3.49***	0.42	8.49***	-10.11***
Txtls	1.57**	2.11*	2.92***	3.32***	2.18	-4.14
Steel	1.32**	-2.91**	0.71	0.08	5.54***	4.22***
Util	1.01	2.32*	0.94	1.53***	2.63	-3.54
Paper	0.94	4.83***	0.29	0.16	0.99	-2.36
Telcm	0.68	1.50	-0.47*	1.39***	-2.11***	4.18***
Mines	0.65	1.84	-0.88**	-1.01	6.43***	-4.19
Mach	0.50	3.47**	-0.99**	-0.70	3.97	-4.39
Hshld	0.29	-0.88	2.64**	-1.71***	1.61	-0.33**
Rail	-0.46	0.63	4.44***	0.54	-0.11**	-9.99***
Oil^	-0.67		0.42	-2.20***	1.67	-2.30
Food	-1.95***	-5.46***	-0.53*	0.85**	-1.12***	-3.87
ElcEq	-1.95***	-4.17***	-0.41*	-0.93	-3.70***	0.09**
Chems	-2.15***	-5.65***	-4.88***	0.85**	2.55	-3.85
Tobac	-4.38***	-10.62***	-0.96**	-1.32**	1.38	-11.76***
Mean	0.12	-0.15	0.85	-0.26	2.46	-3.04

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 15 Callan Periodic Tables for Annualised Returns for a Strategy Long the Market and Short Sectors

This table shows the Callan periodic tables for annualised returns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B). Returns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. The formula used to calculate the returns of the strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$. Callan tables rank each sector from the highest to lowest return in each period.

Panel A: UK, 1900-2017

^Tobacco, Motors, and Leisure start in 1920

1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Motors^ 2.19	Oil 6.87	Engineering 5.57	Motors 2.90	Textiles 10.60	Banks 4.51
Engineering 2.13	Engineering 4.39	Leisure 5.46	Engineering 2.18	Engineering 3.40	Retail 0.49
Food 1.01	Mining 3.81	Shipping 3.50	Banks 2.11	Shipping 3.17	Insurance -0.61
Banks 0.70	Food 2.18	Food 2.98	Insurance 1.97	Chemicals 2.85	Motors -0.69
Leisure^ 0.51	Retail 1.17	Textiles 2.22	Leisure 1.26	Food 2.76	Oil -1.37
Textiles 0.51	Banks -0.04	Mining 0.71	Textiles 1.06	Retail 2.42	Shipping -1.68
Oil 0.23	Chemicals -1.29	Banks 0.64	Tobacco 0.69	Mining 1.30	Leisure -3.56
Retail 0.05	Alcohol -2.36	Tobacco 0.00	Alcohol 0.58	Alcohol 1.16	Mining -3.97
Mining -0.06	Textiles -2.81	Insurance -0.10	Food -0.01	Leisure 0.43	Food -4.19
Shipping -0.40	Shipping -3.39	Motors -0.44	Chemicals -0.34	Tobacco -0.13	Engineering -7.04
Insurance -0.71	Insurance -3.90	Oil -1.84	Retail -1.01	Motors -0.39	Chemicals -7.68
Chemicals -1.48		Alcohol -2.07	Oil -1.47	Insurance -0.81	Alcohol -8.53
Alcohol -1.92		Chemicals -2.43	Mining -3.07	Oil -1.22	Textiles -10.63
Tobacco^ -2.78		Retail -2.61	Shipping -3.73	Banks -2.52	Tobacco -12.43

Panel B: US, 1900-2017

^Oil starts in 1911

1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Coal 2.91	Ships 9.48	Coal 6.85	Txtls 3.32	Coal 8.91
Ships 2.88	Paper 4.83	Rail 4.44	Util 1.53	Ships 8.49
Txtls 1.57	Mach 3.47	Ships 3.49	Telcm 1.39	Mines 6.43
Steel 1.32	Util 2.32	Txtls 2.92	Food 0.85	Steel 5.54
Util 1.01	Txtls 2.11	Hshld 2.64	Chems 0.85	Mach 3.97
Paper 0.94	Mines 1.84	Util 0.94	Rail 0.54	Util 2.63
Telcm 0.68	Telcm 1.50	Steel 0.71	Ships 0.42	Chems 2.55
Mines 0.65	Coal 1.30	Oil 0.42	Paper 0.16	Txtls 2.18
Mach 0.50	Rail 0.63	Paper 0.29	Steel 0.08	Oil 1.67
Hshld 0.29	Hshld -0.88	ElcEq -0.41	Mach -0.70	Hshld 1.61
Rail -0.46	Steel -2.91	Telcm -0.47	ElcEq -0.93	Tobac 1.38
Oil^ -0.67	ElcEq -4.17	Food -0.53	Mines -1.01	Paper 0.99
Food -1.95	Food -5.46	Mines -0.88	Tobac -1.32	Rail -0.11
ElcEq -1.95	Chems -5.65	Tobac -0.96	Hshld -1.71	Food -1.12
Chems -2.15	Tobac -10.62	Mach -0.99	Oil -2.20	Telcm -2.11
Tobac -4.38		Chems -4.88	Coal -5.38	ElcEq -3.70

Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 16: Cumulative Value of Long Short Strategies

This table shows the cumulative returns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B). The cumulative returns are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Returns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. The formula used to calculate the returns of the strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$

Panel A: UK, 1900-2017

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Engineering	12.05***	2.93**	3.88***	1.71***	2.30	0.27**
Motors^	8.36***		0.89*	2.04***	0.91	0.88
Food	3.26	1.71	2.09*	1.00	1.98	0.46
Banks	2.29	0.99	1.17	1.69***	0.53*	2.21***
Textiles	1.81	0.49**	1.73	1.30	12.43***	0.13***
Leisure^	1.65		3.78***	1.37	1.11	0.52
Oil	1.31	5.27***	0.63**	0.69***	0.74*	0.78
Retail	1.07	1.34	0.52***	0.78**	1.82	1.09***
Mining	0.93	2.55*	1.19	0.46***	1.38	0.48
Shipping	0.62	0.42**	2.36**	0.39***	2.18	0.74
Insurance	0.43	0.37**	0.98*	1.63***	0.82	0.90
Chemicals	0.17*	0.72*	0.54***	0.92*	2.02	0.24**
Alcohol	0.10*	0.55**	0.59***	1.16	1.34	0.20**
Tobacco^	0.06***		1.00	1.19	0.97	0.09***
Mean	2.19	1.58	1.53	1.17	2.18	0.64

Panel B: US, 1900-2017

^Oil starts in 1911

	1900-2017^	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Coal	29.56***	1.38	5.24***	0.25***	8.46***	1.93***
Ships	28.39***	9.62***	2.36**	1.11	7.66***	0.15***
Txtls	6.28	1.69	2.05	2.26***	1.72	0.47*
Steel	4.73	0.48*	1.19	1.02	3.85*	2.10***
Util	3.28	1.77	1.26	1.46***	1.92	0.52
Paper	3.02	3.25**	1.07	1.04	1.28**	0.65
Telcm	2.23	1.45	0.89*	1.41***	0.59***	2.09***
Mines	2.16	1.58	0.80**	0.78**	4.75***	0.46*
Mach	1.81	2.35	0.78**	0.84	2.65	0.45*
Hshld	1.40	0.80	1.92	0.65***	1.49*	0.94
Rail	0.58*	1.17	2.96***	1.14	0.97**	0.15***
Oil^	0.49**		1.11	0.57***	1.51*	0.66
Food	0.10**	0.25**	0.88**	1.24*	0.75***	0.49*
ElcEq	0.10**	0.35**	0.90*	0.79*	0.39***	1.02
Chems	0.08**	0.23**	0.29***	1.24*	1.88	0.49*
Tobac	0.01**	0.06**	0.79**	0.72**	1.41*	0.11***
Mean	5.58	1.76	1.53	1.03	2.58	0.79

Significance levels: * p<0.1, ** p<0,05, ***p <0.01; Source: DMS (2015), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 17: Maximum Drawdowns for Long Short Strategies, 1900-2017

This table shows the maximum drawdown of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B). Maximum drawdowns are tested for significance relative to the mean in each period. The mean reported for 1900-2017 excludes sectors starting after 1900. For series starting after 1900, significance for 1900-2017 is tested relative to the mean calculated using only data from when the series starts. Drawdowns are shown for the full analysis period and for selected subperiods of 25 years each, except for the last period which is 18 years. The formula used to calculate the returns of the long short strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$. Drawdowns are defined as the difference between the portfolio's value on a particular date and its high-water mark (the highest historic value up to that date), divided by the high-water mark, and are expressed as percentages. A maximum drawdown of 96 implies that at some point the strategy's total return was 96% lower than its highest previous value.

Panel A: UK

^Tobacco, Motors, and Leisure start in 1920

	1900-2017^	1950-2017	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobacco^	96***	96		37	43	78***	91***
Oil	96***	76	87***	59***	58***	40	45***
Alcohol	91***	83	52	50**	42	46	80***
Mining	90***	88	23***	35**	78***	46	79***
Textiles	87*	87	61	30***	42	38	87***
Chemicals	83	79	48	52**	34**	29***	76**
Shipping	78	61	78***	48	61***	41	41***
Retail	77	50	19***	56***	43	38	39***
Engineering	76	76	39	50*	10***	17***	76**
Banks	75*	75	26***	18***	44	65***	34***
Insurance	71***	48	63*	28***	42	48	41***
Leisure^	69**	63		44	58**	39	59
Motors^	68**	68		60***	43	42	68
Food	66***	66	61	31***	34**	32**	66
Mean	81	73	51	43	45	43	63

Panel B: US

^Oil starts in 1911

	1900-2017^	1950-2017	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
Tobac	100***	96	94***	62**	68***	78***	90***
Chems	96***	51	83**	77***	37**	28***	51*
Coal	94***	94	66	67***	80***	29***	91***
Food	93***	82	80**	35***	42	76***	59
ElcEq	93**	77	65	49	45	61***	36***
Rail	90*	90	21***	30***	31***	61***	85***
Steel	90	58	88***	43**	43	26***	58
Ships	86	86	73	49	45	45	86***
Mach	85	57	76	52	27***	17***	55
Hshld	84	67	84***	23***	67***	26***	38***
Oil^	83	73		40**	43	45	69
Mines	83	83	66	43**	64***	36	83***
Paper	79**	54	77	79***	34***	35*	36***
Txtls	73***	73	68	65***	59***	65***	60
Util	69***	61	34***	53	30***	28***	61
Telcm	61***	61	32***	60*	36**	60***	29***
Mean	85	73	67	52	47	45	62

Significance levels: * p<0.1, ** p<0,05, ***p <0.01; Source: DMS (2018), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 18 Rolling Median Maximum Drawdowns for Long Short Strategies

This table shows the median maximum drawdowns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B) using data from 1900 to 2017. We calculate the maximum drawdowns using one year rolling windows of 10, 20, and 30-years over the analysis period and then take the median of the maximum drawdowns for each sector and aggregation period (10, 20 or 30 years). The maximum drawdowns are tested for significance relative to the mean median drawdown in each period. Returns of the long short strategy in each period are calculates as: $(1 + R_{market}) / (1 + R_{industry})$. Drawdowns are defined as the difference between the portfolio's value on a particular date and its high-water mark (the highest historic value up to that date), divided by the high-water mark, and are expressed as percentages. A median maximum drawdown of 39 implies that the median among all the maximum drawdowns of a strategy over a given period (e. g. 10-year rolling window) is a 39% maximum drawdown.

Panel A: UK

*Tobacco, Motors, and Leisure start in 1920

	10	**20**	**30**
Oil	39***	57***	62***
Motors^	39***	43	48
Shipping	35***	48**	59***
Mining	35**	58***	64***
Tobacco^	34**	46	60***
Alcohol	33**	46	51
Textiles	30	41	42
Retail	28	41	50
Leisure^	28	44	53
Chemicals	27	34*	43
Insurance	25	37	42
Food	25*	32**	34***
Banks	20***	33**	44
Engineering	17***	21***	35***
Mean	28	41	48

Panel B: USA

*Oil starts in 1911

	10	**20**	**30**
Tobac	52***	67***	78***
Txtls	44***	59***	64**
Coal	43***	67***	75***
Ships	39**	49	53
Food	35	53**	66***
Paper	33	45	49*
Steel	33	44	52
Mines	32	44	58
ElcEq	32	44	54
Telcm	32	36***	57
Oil^	31	46	56
Chems	29**	43	43***
Mach	28***	38**	51
Util	26***	30***	42***
Hshld	24***	38**	53
Rail	23***	30***	30***
Mean	34	46	55

Significance levels: * p<0.1, ** p<0,05, ***p <0.01; ;Source: DMS (2018), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 19: Rolling Mean Annualised Returns Long Short Strategies ,1900-2017

This table shows the percentile distribution of annualised returns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B). We use data from 1900 to 2017, and for each sector calculate the mean strategy results over one year rolling windows of 10, 20, and 30 years. The formula used to calculate the returns of the strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$

Panel A: UK

Excludes Tobacco, Motors, and Leisure which start in 1920

Percentile\Period	10	20	30
0.05	-1.46	-1.52	-1.43
0.25	-0.45	-0.50	-0.60
0.50	-0.07	0.09	-0.09
0.75	0.76	0.59	0.71
0.95	1.95	2.58	2.55

Panel B: USA

Includes Oil which starts in 1911

Percentile\Period	10	20	30
0.05	-2.43	-2.16	-2.03
0.25	-1.14	-1.12	-1.15
0.50	0.48	0.34	0.33
0.75	1.04	0.98	0.96
0.95	2.36	2.33	2.28

Source: DMS (2018), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 20: Rolling Mean Annualised Returns Long Short Strategies ,1900-2017

This table shows the rolling mean annualised returns of a strategy short a sector and long the market in the UK (Panel A) and USA (Panel B) using data from 1900 to 2017, over one year rolling windows of 10, 20, and 30 years. For each sector, we calculate the annualised returns using one year rolling windows of 10, 20, and 30-years over the analysis period and then take the mean of the returns for each aggregation period (10,20 or 30 years). The formula used to calculate the returns of the long short strategy in each period is: $(1 + R_{market}) / (1 + R_{industry})$.

Panel A: UK

^Tobacco, Motors, and Leisure start in 1920

Industry\Period	10	20	30
Engineering	2.76***	3.34***	3.17***
Leisure^	1.50***	1.44***	1.31***
Motors^	1.18**	0.97***	1.07***
Textiles	1.14*	1.83***	1.93***
Food	0.77**	0.87***	1.02***
Banks	0.75*	0.3	0.40**
Mining	0.03	0.09	-0.09
Shipping	-0.07	0.26	0.32
Retail	-0.22	-0.33*	-0.51***
Insurance	-0.43	-0.34	-0.15
Oil	-0.47	-1.48***	-1.44***
Chemicals	-1.13***	-0.67***	-0.70***
Alcohol	-1.79***	-1.56***	-1.42***
Tobacco^	-2.25***	-1.63***	-1.23**

Test for Significance of Returns different from 0, * p<0.1, ** p<0,05, ***p <0.01

Panel B: USA

^Oil starts in 1911

Industry\Period	10	20	30
Ships	3.19***	3.46***	3.52***
Coal	2.08*	1.55**	1.86***
Txtls	1.99***	1.95***	1.76***
Mach	1.20**	0.74**	0.58***
Steel	0.99**	1.22***	1.37***
Util	0.80**	0.78***	0.76***
Mines	0.75	0.90***	0.82***
Telcm	0.48	0.35	0.21
Paper	0.48	0.03	0.06
Hshld	0.11	-0.35	-0.09
Rail	-0.09	0.33	0.46
Oil^	-0.92**	-0.88***	-0.99***
ElcEq	-1.78***	-1.86***	-1.66***
Food	-2.09***	-1.99***	-1.86***
Chems	-2.15***	-1.84***	-1.63***
Tobac	-3.26***	-2.69***	-2.54***

Test for Significance of Returns different from 0, * p<0.1, ** p<0,05, ***p <0.01

Source: DMS (2018), French (2019), Thomson Reuters (2019), FTSE Russell (2019)

Table 21: Annualised Real USD Returns and Total Returns for Minerals and selected Equities

This table shows inflation-adjusted USD returns for selected minerals and natural resources as well as for US treasury bills and equity returns. Annualised real returns (Panel A) and total real returns (Panel B) are shown over the full analysis period and for selected subperiods. We adjust raw returns into real returns using inflation data in DMS (2018)

Panel A: Annualised Real Returns, 1900-2017
*Oil equity returns start in 1911

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
platinum	1.43	9.56	-3.04	0.00	-0.73	1.98
gold	0.66	-2.78	1.46	2.94	-2.84	6.39
oil	0.32	-2.38	-0.37	4.43	-2.90	4.09
silver	0.00	-2.02	-3.43	6.81	-4.19	4.58
diamonds	-0.55	0.08	-1.28	-1.93	-0.49	1.47
tbills	0.81	2.15	-0.13	0.26	1.94	-0.54
US oil Sector*	7.07		5.21	8.42	9.89	5.95
US mines Sector	5.79	2.94	6.59	7.11	4.97	8.04
US Equities	6.48	4.83	5.65	6.03	11.73	3.51
World Equities	5.18	1.72	3.66	6.90	10.32	2.88

Panel B: Total Real Returns, 1900-2017
*Oil equity returns start in 1911

	1900-2017*	1900-1924	1925-1949	1950-1974	1975-1999	2000-2017
platinum	5.36	9.81	0.46	1.00	0.83	1.42
gold	2.18	0.49	1.44	2.06	0.49	3.05
oil	1.46	0.55	0.91	2.96	0.48	2.06
silver	1.00	0.60	0.42	5.19	0.34	2.24
diamonds	0.52	1.02	0.72	0.61	0.89	1.30
tbills	2.58	1.70	0.97	1.07	1.62	0.91
US oil Sector*	1,488.15		3.56	7.55	10.58	2.83
US mines Sector	766.57	2.06	4.93	5.57	3.37	4.02
US Equities	1,653.83	3.25	3.95	4.33	15.99	1.86
World Equities	386.58	1.53	2.45	5.30	11.65	1.67

Sources: onlygold.com (2018), Officer and Williamson (2018), US Geological Survey (2018), Stooq (2018), Katzav/IDEX (2018), Spaenjers (2016), BP (2018), DMS (2018).

Table 22: Regressions of change in mineral price on market returns

This table shows regressions of log mineral prices on log real returns of the market series. Panel A displays the full sample results, and the other Panels (B to F) have results for the different subsamples. We use inflation data in DMS (2018) we convert the total returns and price series to inflation-adjusted returns and prices. Then log returns for year t are calculated as: $Return_t = \ln (TR_t / TR_{t-1})$, Where TR_t is the value of a cumulative return series at year t.

Panel A: 1911-2017

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	0.017	0.026	0.026	-0.001	0.014	0.001	-0.007
	(0.025)	*(0.023)*	*(0.023)*	*(0.018)*	*(0.014)*	*(0.021)*	*(0.012)*
US oil-sector market return	–0.079	0.435**	0.432**				
	(0.112)	*(0.166)*	*(0.166)*				
US mines-sector market return				0.323***	0.368***	0.367***	0.051
				(0.099)	*(0.079)*	*(0.118)*	*(0.069)*
US equity market return		–0.719***	–0.500*	-0.814***	-0.664***	-0.556**	-0.042
		(0.181)	*(0.301)*	*(0.213)*	*(0.169)*	*(0.254)*	*(0.148)*
World equity market return			–0.263	0.689***	0.309*	0.307	-0.030
			(0.289)	*(0.228)*	*(0.181)*	*(0.272)*	*(0.159)*
Number of observations	107	107	107	107	107	107	107
Adjusted R^2	–0.005	0.120	0.118	0.179	0.201	0.091	-0.023
F Statistic	0.507	8.198***	5.732***	8.728***	9.892***	4.541***	0.197

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Panel B: 1911–1924

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	0.037	0.038	0.036	0.042	-0.040*	-0.015	-0.009
	(0.060)	*(0.059)*	*(0.064)*	*(0.054)*	*(0.019)*	*(0.040)*	*(0.036)*
US oil-sector market return	-0.464**	-0.146	-0.165				
	(0.210)	*(0.338)*	*(0.384)*				
US mines-sector market return				-0.671	0.047	-0.149	0.247
				(0.464)	*(0.167)*	*(0.342)*	*(0.311)*
US equity market return		-0.601	-0.520	0.268	-0.032	-0.221	-0.222
		(0.505)	*(0.821)*	*(0.613)*	*(0.221)*	*(0.451)*	*(0.410)*
World equity market return			-0.084	0.771	0.296	0.382	-0.326
			(0.653)	*(0.521)*	*(0.188)*	*(0.384)*	*(0.349)*
Number of observations	14	14	14	14	14	14	14
Adjusted R^2	0.231	0.257	0.184	0.015	0.318	-0.131	-0.097
F Statistic	4.901**	3.245*	1.975	1.066	3.017*	0.500	0.616

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Panel C: 1925–1949

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	-0.010	-0.004	-0.005	-0.032	0.010	-0.054	-0.013
	(0.044)	*(0.042)*	*(0.043)*	*(0.037)*	*(0.019)*	*(0.039)*	*(0.037)*
US oil-sector market return	0.124	0.729*	0.746*				
	(0.180)	*(0.360)*	*(0.397)*				
US mines-sector market return				0.317	0.147	0.185	-0.916*
				(0.468)	*(0.244)*	*(0.491)*	*(0.466)*
US equity market return		-0.661*	-0.630	-0.339	-0.403*	-0.532	0.490
		(0.347)	*(0.451)*	*(0.410)*	*(0.214)*	*(0.430)*	*(0.408)*
World equity market return			-0.064	-0.022	0.489	1.017	0.884
			(0.558)	*(0.585)*	*(0.305)*	*(0.615)*	*(0.583)*
Number of observations	25	25	25	25	25	25	25
Adjusted R^2	-0.022	0.083	0.039	-0.102	0.207	0.300	0.093
F Statistic	0.476	2.079	1.328	0.258	3.082**	4.430**	1.822

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Panel D 1950–1974

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	0.092*	0.089*	0.099*	-0.029	0.015	0.062	-0.028**
	(0.046)	*(0.046)*	*(0.052)*	*(0.025)*	*(0.028)*	*(0.040)*	*(0.011)*
US oil-sector market return	-0.601**	-0.214	-0.243				
	(0.216)	*(0.382)*	*(0.396)*				
US mines-sector market return				0.271*	0.433***	0.475**	0.298***
				(0.138)	*(0.151)*	*(0.218)*	*(0.060)*
US equity market return		-0.480	0.096	-1.674**	-2.361***	-1.114	-0.971***
		(0.393)	*(1.479)*	*(0.730)*	*(0.798)*	*(1.155)*	*(0.317)*
World equity market return			-0.617	1.625**	1.836**	0.548	0.674*
			(1.525)	*(0.765)*	*(0.837)*	*(1.211)*	*(0.333)*
Number of observations	25	25	25	25	25	25	25
Adjusted R^2	0.219	0.235	0.205	0.138	0.392	0.115	0.532
F Statistic	7.714**	4.685**	3.059*	2.278	6.151***	2.035	10.108***

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Panel E: 1975–1999

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	-0.076	-0.010	0.007	-0.018	-0.015	-0.048	0.032
	(0.057)	*(0.062)*	*(0.055)*	*(0.061)*	*(0.061)*	*(0.070)*	*(0.031)*
US oil-sector market return	0.496	0.935**	0.987***				
	(0.304)	*(0.354)*	*(0.315)*				
US mines-sector market return				0.309	0.353	0.751**	0.065
				(0.242)	*(0.243)*	*(0.280)*	*(0.125)*
US equity market return		-0.969*	-0.075	-1.094*	-0.796	-0.660	-0.501*
		(0.468)	*(0.536)*	*(0.561)*	*(0.563)*	*(0.649)*	*(0.289)*
World equity market return			-1.239**	1.188**	0.587	0.422	0.156
			(0.469)	*(0.508)*	*(0.511)*	*(0.588)*	*(0.262)*
Number of observations	25	25	25	25	25	25	25
Adjusted R^2	0.065	0.182	0.356	0.148	0.020	0.177	0.032
F Statistic	2.672	3.667**	5.429***	2.391*	1.167	2.724*	1.263

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Panel F: 2000-2017

Dependent variable→	Oil price	Oil price	Oil price	Platinum price	Gold price	Silver price	Diamond index
Constant	0.017	0.012	0.005	-0.006	0.056*	0.056	0.014
	(0.070)	*(0.060)*	*(0.064)*	*(0.039)*	*(0.029)*	*(0.061)*	*(0.022)*
US oil-sector market return	0.393	1.108**	1.165**				
	(0.364)	*(0.419)*	*(0.452)*				
US mines-sector market return				0.553***	0.365**	0.024	0.004
				(0.175)	*(0.129)*	*(0.272)*	*(0.099)*
US equity market return		-1.047**	-0.355	-1.722	-1.165	-1.368	0.148
		(0.407)	*(1.725)*	*(1.122)*	*(0.824)*	*(1.741)*	*(0.636)*
World equity market return			-0.690	1.473	0.624	1.189	-0.186
			(1.669)	*(1.155)*	*(0.848)*	*(1.791)*	*(0.654)*
Number of observations	18	18	18	18	18	18	18
Adjusted R^2	0.010	0.267	0.224	0.639	0.410	-0.151	-0.194
F Statistic	1.167	4.098**	2.638*	11.049***	4.939**	0.255	0.079

Note: * denotes p<0.1, ** denotes p<0.05, and *** denotes p<0.01

Sources: onlygold.com (2018), Officer and Williamson (2018), US Geological Survey (2018), Stooq (2018), Katzav/IDEX (2018), Spaenjers (2016), BP (2018), DMS (2018). Also see text.

Table 23: Sector weights for the world and for major markets

This table shows sector weights for the World, United States, United Kingdom, Japan, Germany, and Emerging markets geographies, in June 2018 (Panel A) and December 2010 (Panel B). We use the ten sectors from the ICB (Industry Classification Benchmark) standard. The weightings are based on FTSE Russell data.

Panel A: June 2018

	World	United States	United Kingdom	Japan	Germany	Emerging markets
Financials	22	19	21	14	17	28
Technology	15	22	1	5	11	17
Industrials	13	12	10	23	16	8
Consumer Goods	12	8	16	25	19	8
Consumer Services	11	13	11	11	3	13
Healthcare	10	13	10	7	14	3
Oil & Gas	7	6	16	1	0	8
Basic materials	5	2	9	6	14	7
Utilities	3	3	3	2	3	3
Telecoms	3	2	3	5	4	5

Source: FTSE Russell (2018)

Panel B: December 2010

	World	United States	United Kingdom	Japan	Germany	Emerging markets
Financials	21	17	20	18	16	26
Industrials	12	12	4	21	20	10
Consumer Goods	12	10	12	23	19	7
Oil & Gas	11	11	19	2	0	16
Technology	10	17	1	7	6	7
Basic materials	9	3	15	8	19	16
Consumer Services	9	12	9	8	2	5
Healthcare	7	10	8	5	3	1
Telecoms	5	3	7	4	4	8
Utilities	4	3	4	5	9	4

Source: FTSE Russell (2010)

Table 24: Country concentration of FTSE All World Index sectors, June 2018

This table displays the top country weights in industries at June 2018 (Panel A) and December 2010 (Panel B). It shows the respective weights in the industry for the largest country in each industry, the second largest country, and the combined weighting of the top two country weights. It then lists the country with the largest weight in each industry and the second-largest country. We use the 39 ICB (Industry Classification Benchmark) industries for which we have data (out of 41 industries). The weightings are based on FTSE Russell data.

Panel A: June 2018

Industry\ % Weights & Countries	% Largest country	% Second largest country	% Two largest countries	Largest country	Second Largest country
Aerospace & Defense	73	15	88	USA	France
Software & Computer Serv.	77	11	88	USA	China
Oil Equip. Services & Distrib.	62	25	87	USA	Canada
Technology Hard. & Equip.	77	8	86	USA	Taiwan
Tobacco	51	33	84	USA	UK
Alternative Energy	42	41	83	China	Denmark
Health Care Equip. & Serv.	79	4	83	USA	Germany
RE Investment Trusts	76	7	83	USA	Australia
General Retailers	71	11	81	USA	China
Hous. Goods & Home Constr.	61	15	76	USA	UK
Support Services	61	15	76	USA	Japan
Financial Services	71	4	75	USA	Japan
Electronic & Electrical Equip.	37	35	72	Japan	USA
Leisure Goods	41	31	72	South Korea	Japan
General Industrials	59	13	72	USA	Germany
Travel & Leisure	53	18	71	USA	Japan
Nonlife Insurance	61	10	71	USA	Germany
Mining	42	28	70	UK	Australia
Media	59	11	70	USA	South Africa
Fixed Line Telecom.	64	5	69	USA	Spain
Pharma. & Biotechnology	56	11	67	USA	Switzerland
Electricity	58	7	65	USA	Spain
Oil & Gas Producers	48	17	65	USA	UK
Food Producers	34	30	64	USA	Switzerland
Beverages	53	11	64	USA	UK
Industrial Transportation	52	11	63	USA	Canada
Industrial Engineering	35	28	62	USA	Japan
Automobiles & Parts	38	23	61	Japan	USA
Food & Drug Retailers	45	9	54	USA	UK
Chemicals	37	16	53	USA	Germany
Forestry & Paper	30	21	51	Finland	USA
Gas Water & Multiutilities	33	14	47	USA	UK
Personal Goods	31	15	47	USA	France
Real Estate Inv. & Services	24	21	45	Hong Kong	Japan
Banks	32	9	41	USA	Canada
Mobile Telecommunications	27	13	40	Japan	UK
Life Insurance	22	16	38	USA	UK
Construction & Materials	17	17	34	Japan	USA
Industrial Metals & Mining	17	15	31	USA	Brazil

Source: FTSE Russell (2018)

Panel B: December 2010

Industry\ % Weights & Countries	% Largest country	% Second largest country	% Two largest countries	Largest country	Second Largest country
Aerospace & Defense	77	11	88	USA	UK
Software & Computer Serv.	82	5	87	USA	India
Health Care Equip.& Services	81	4	85	USA	Germany
Tobacco	52	31	83	USA	UK
Hous. Goods & Home Constr.	68	11	80	USA	UK
Leisure Goods	62	16	78	Japan	USA
RE Investment Trusts	58	18	76	USA	Australia
General Retailers	68	8	76	USA	Japan
Oil Equip. Serv. & Distrib.	65	10	75	USA	Canada
Technology Hard. & Equip.	63	11	75	USA	Taiwan
Support Services	44	28	72	USA	Japan
Media	60	10	70	USA	UK
General Industrials	51	18	69	USA	Germany
Electronic & Electrical Equip.	35	31	66	USA	Japan
Pharma. & Biotechnology	50	15	65	USA	Switzerland
Financial Services	58	6	64	USA	Japan
Beverages	49	15	64	USA	UK
Travel & Leisure	49	15	63	USA	Japan
Nonlife Insurance	51	11	63	USA	Germany
Fixed Line Telecom.	46	14	60	USA	Spain
RE Investment & Services	41	18	59	Hong Kong	Japan
Food Producers	32	27	58	USA	Switzerland
Food & Drug Retailers	41	17	58	USA	UK
Automobiles & Parts	38	19	57	Japan	USA
Oil & Gas Producers	40	16	56	USA	UK
Industrial Engineering	34	21	55	USA	Japan
Electricity	41	13	54	USA	Japan
Industrial Transportation	45	9	54	USA	Canada
Personal Goods	30	23	54	USA	France
Mining	33	21	53	UK	Australia
Alternative Energy	30	23	53	USA	Denmark
Forestry & Paper	28	21	49	Finland	USA
Chemicals	26	21	47	USA	Germany
Gas Water & Multiutilities	21	20	41	Germany	USA
Life Insurance	25	15	40	USA	UK
Mobile Telecommunications	21	12	33	UK	Japan
Banks	23	10	33	USA	UK
Construction & Materials	17	14	31	France	USA
Industrial Metals & Mining	19	12	31	USA	Japan

Source: FTSE Russell (2010)

Table 25: Sector concentration of FTSE All World Index countries, June 2018

This table shows the weight of the three largest industries in each country in June 2018 (Panel A) and December 2010 (Panel B). We use all countries in the FTSE All World Index in each period. In each time period we have 47 countries, however in December 2010 Qatar is in the index, while in June 2018 Morocco is included instead. The other 46 countries overlap. The weightings are based on FTSE Russell data.

Panel A: June 2018

Country\% weight	largest industry	next two largest industries	three largest industries
Peru	81	19	100
Ireland	50	50	100
Portugal	44	56	100
Pakistan	50	50	100
Czech Republic	52	45	97
Hungary	53	43	96
Colombia	37	48	85
Qatar	65	19	84
Austria	45	38	83
Russian Federation	54	29	83
UAE	36	44	79
Egypt	54	22	76
Belgium	47	26	73
Denmark	48	22	70
Greece	41	29	70
Indonesia	42	24	66
Israel	28	38	66
Singapore	48	17	65
Norway	29	35	64
Taiwan	44	20	64
Switzerland	31	32	63
Poland	34	28	62
New Zealand	27	34	61
Spain	37	22	60
Finland	20	38	58
Sweden	27	31	57
Malaysia	33	23	56
Philippines	24	32	56
China	25	31	56
Italy	26	27	53
Chile	22	30	52
Canada	31	21	51
South Africa	30	21	51
Turkey	29	22	51
Brazil	22	26	48
South Korea	33	15	47
Hong Kong	19	28	47
Australia	28	19	47
Thailand	20	26	47
Mexico	15	30	45
Netherlands	16	28	44
India	16	27	43
UK	16	21	37
Germany	14	21	35
USA	12	17	29
France	11	18	29
Japan	11	14	25

Source: FTSE Russell (2018)

Panel B: December 2010

Country\% weight	largest industry	next two largest industries	three largest industries
Morocco	67	33	100
Peru	54	46	100
Pakistan	49	47	96
Czech Republic	56	39	95
Hungary	42	52	94
UAE	33	49	83
Ireland	53	29	82
Russian Federation	59	22	81
Greece	48	31	78
Israel	50	26	76
Denmark	46	28	74
Spain	36	37	73
Poland	42	29	71
Austria	36	31	68
Colombia	28	40	68
Turkey	48	19	67
Portugal	28	39	66
Taiwan	40	25	66
Belgium	45	21	66
Thailand	30	35	65
Finland	31	33	64
Switzerland	27	36	64
Sweden	29	34	63
Indonesia	24	37	61
Mexico	30	31	60
Egypt	24	37	60
Philippines	24	33	58
Malaysia	35	22	57
Brazil	23	33	57
Australia	28	29	57
Canada	22	34	56
Italy	25	31	56
New Zealand	23	32	55
Norway	27	28	55
China	29	26	55
Chile	21	27	48
Singapore	25	23	48
UK	18	29	48
Hong Kong	25	22	47
Germany	19	28	47
South Africa	20	26	46
Netherlands	15	29	43
South Korea	22	20	42
India	14	26	41
France	10	20	30
Japan	12	17	28
USA	9	16	26

Source: FTSE Russell (2010)

Chapter 3

Survey on Sector Exclusions

Survey on Sector Exclusions[1]

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Abstract

We survey industry professionals' views on sector exclusions. Respondents consider negative portfolio screenings most useful for attracting funds from ethically concerned investors and least useful for risk management purposes. Professionals do not anticipate controversial sector outperformance. However, they disagree the least about the expected returns of non-controversial sectors relative to controversial sectors. Investor disagreement has been linked to higher realised returns, suggesting one reason why ex-ante expectations can differ from ex-post realisations. Exclusion scepticism does not seem to stem from an expectation of controversial stocks superior performance, indicating that favourable risk and return expectations are not its driving force.

JEL Classification: G11; G15; G23; G41; Q51

Keywords: Divestment; negative screening; activism; fossil fuel; corporate social responsibility (CSR); environmental, social, and governance (ESG)

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1 Introduction

Fears about the consequences of global warming are increasingly giving rise to grassroots campaigns to address the issue. The University of Cambridge, an academic institution dating back to 1209, has recently been in the forefront of this discussion. Chambers, Dimson and Quigley (2019) detail the experiences of the endowment office in the last few years. In 2018, in the midst of a fossil fuel divestment campaign spearheaded by university stakeholders, which included both students and academic staff, the university lost its Chief Investment Officer (CIO) and the majority of his team. Having faced persistent student protests and demonstrations as well as several university working groups on the topic of divestment, they elected to instead run the sizable endowment of a wealthy British family. A new CIO was swiftly appointed. However, they too are facing similar challenges as the previous administration with respect to responsible investing practices. While specific campaign demands can vary by movement, excluding companies from investment portfolios, often referred to with the term "divestment", is a popular and easy to articulate call to action. Groups such as 350.org[3] have continuously campaigned for fossil fuel divestment. It is estimated that 985 institutional investors with over $6.24TN assets under management have pledged to divest from fossil fuels (Arabella Advisors (2018)). However, while fossil fuels are the latest sectors to be targeted for exclusion by campaigners, they are certainly not the first. Prior campaigns have focused on socially controversial stocks, such as those in the alcohol[4] and tobacco[5] industries, as well as companies associated with the South African Apartheid (Welch and Wazzan (1999), Grossman and Sharpe (1986)).

[3] https://350.org; https://350.org/350-campaign-update-divestment/; http://gofossilfree.org;

[4] http://www.add-resources.org/norwegian-ngo-campaign-divest-from-the-alcohol-industry.5907103-315784.html; https://www.ipe.com/countries/norway/klp-blacklists-nok3bn-of-alcohol-and-gambling-investments/www.ipe.com/countries/norway/klp-blacklists-nok3bn-of-alcohol-and-gambling-investments/10031380.fullarticle;

[5] https://uk.reuters.com/article/us-europe-funds-tobacco-divestment/european-fund-firms-largely-resist-tobacco-divestment-campaign-idUKKCN11C1PW; https://www.ipe.com/countries/uk/uks-nest-quits-smoking-in-two-year-tobacco-divestment-project/www.ipe.com/countries/uk/uks-nest-quits-smoking-in-two-year-tobacco-divestment-project/10031682.fullarticle; https://www.fnlondon.com/articles/carmignac-latest-to-dump-tobacco-as-divestment-movement-grows-20180928; https://www.ft.com/content/e87a9b3c-0708-11e6-9b51-0fb5e65703ce;

Divestment campaigns tend to attract considerable media attention, whether they are directed at prominent universities,[6] other endowments,[7] or for-profit investors.[8] Recently other methods of addressing sustainability have also gained popularity, such as impact investing (Barber, Morse and Yasuda (2018)) and engagements with companies (Dimson, Karakaş and Li (2015), Dimson, Karakaş and Li (2018), Hoepner, Oikonomou, Sautner, Starks, *et al.* (2018)). Nevertheless, according to the Global Sustainable Investment Alliance, (2018), negative/exclusionary screening is the largest sustainable investment strategy globally, with $19.8TN of professionally managed assets being managed in accordance with it.

However, there can be multiple reasons for industry professionals to consider sector exclusions, such as making an impact (Heinkel, Kraus and Zechner (2001), Atta-Darkua (2019)), risk management,[9], avoiding guilt or complicity for climate change (Nagell (2011)), avoiding reputational damage,[10] a branding tool to attract investor funds (Hartzmark and Sussman (2018), Ceccarelli, Ramelli and Wagner (2019)), or a means to express moral, cultural or religious beliefs (Ibrahim (2007)). While divestment campaigns can mention a combination reasons why investors should engage in the practice, distinguishing between the importance of each can be hard. Moreover, campaigners are can often be outsiders to the organisations whose behaviour they are attempting to affect.

Investors who screen sectors out of their portfolios usually disclose their reasons at announcement time However, we know little about the decision-making processes that underpin divestment and blacklisting policies. Multiple reasons may have been considered, and their relative and absolute importance can vary by investor. Furthermore, once an exclusion is made, other investors process and react to the signal it provides to the market based on their assessment of the relevance of the stated reason.[11] How the specified motivation aligns with their own views is likely to affect their response to it. Moreover, prediction of other investor reactions can be improved by establishing whether market participants as a whole have similar beliefs on negative screenings or if there are clusters of differing opinions on the matter. Divestment activists could also benefit from knowing which arguments may gain more

[6] https://www.vox.com/2019/5/13/18282438/fossil-fuel-divestment-climate-finance; https://www.theguardian.com/environment/2019/may/07/cambridge-university-agrees-explore-fossil-fuel-divestment-plan;

[7] https://www.theguardian.com/environment/2019/jul/04/national-trust-to-divest-portfolio-from-fossil-fuels; https://www.bloomberg.com/news/articles/2019-06-20/large-exxon-shareholder-starts-divesting-over-climate-change;

[8] https://www.ft.com/content/57d71893-5ae6-3a14-80ae-b82fdfbd1729;

[9] For example, to avoid the potential problem of stranded assets, as in https://www.carbontracker.org/terms/stranded-assets/

[10] For example, Church of England's decision to sell out of Wonga.com, see https://www.bbc.co.uk/news/business-28257351

[11] Both the reported reason and the one which they consider to be the true underlying reason for the exclusion

sympathy with financial professionals. Finally, firms which are targets of such campaigns would be able to better anticipate their exposure to them when they are aware of the priorities and beliefs of the finance industry.

Therefore, the main contribution of the paper is to document professionals' views on the merits of various motives of sector exclusions. Previous work has discussed governance-motivated exit (McCahery, Sautner and Starks (2016)) and climate risks leading to divestment (Krueger, Sautner and Starks (2018)). However, to our knowledge we are the first to examine relative and absolute support for a wide spectrum of reasons to divest, such as attracting investor funds, changing firm behaviour, conforming to moral or cultural/religious beliefs, avoiding guilt or complicity, and as a tool for risk management. Furthermore, we also examine professionals' beliefs surrounding the return and risk properties of selected controversial and non-controversial sectors and how these align with their divestment beliefs. Finally, we collect data on respondent climate beliefs and characteristics and evaluate how these relate to negative screening opinions. We also group respondents into clusters based on their exclusion beliefs and show how these are associated with selected sector risk and return beliefs and climate change beliefs.

First, we document how sympathetic professionals are towards different motives for negative screenings. Industry professionals assert that exclusions can be most useful as a branding tool to attract funds from ethically concerned investors. Evidence for this channel is provided in empirical work by Hartzmark and Sussman (2018) and Ceccarelli, Ramelli and Wagner (2019). The second most supported reason to use divestment was to conform to moral beliefs. This is followed by two motives related to global warming – addressing climate change views and addressing responsibility for climate change harms. Statements related to portfolio risk management received the lowest levels of support.

When we group respondents based on their divestment beliefs, the first group ("sceptics") contains those who generally do not believe that negative screenings are useful, across all potential reasons we present. The second cluster ("questioners") contains professionals who support divestments for Branding and Belief purposes, but not for other reasons. Finally, the last group ("devotees") contains members who generally consider sector exclusions useful across all reasons we present. We present our results by cluster in order to account for potential under-sampling of certain groups based on their divestment beliefs.

Next, we document professionals' beliefs about the return and risk properties of selected sectors. Respondents do not report expecting controversial sectors to have higher returns than non-controversial sectors. However, they disagree the least about the returns of non-

controversial sectors. Since investor disagreement is linked to higher expected stock returns (Carlin, Longstaff and Matoba (2014)), this finding lends support to empirical findings that controversial stocks outperform (Hong and Kacperczyk (2009)).

Furthermore, we find that return expectations are not connected to exclusion preferences. In contrast, there is a connection when we examine risk expectations. "Devotees" tend to form risk estimates with the least resemblance to past sector risk profiles than "sceptics" or "questioners". In general, members across all opinion groups expect non-controversial sectors (Consumer Goods, Technology) to have better risk return trade-offs than environmentally controversial sectors (Coal, Mining, Oil & Gas). Therefore, our results suggest that divestment scepticism is not driven by a conviction that controversial stocks offer superior performance to non-controversial stocks.

Finally, we query climate change opinions. Respondents almost universally believe that global warming is happening (98%), and a large majority (87%) also consider that human activities are its cause. Furthermore, they also acknowledge that global warming can have adverse consequences, with over half (57%) stating that global warming has started to harm people currently, which rises to 77% among "sceptics". However, despite this, emotional attachment to global warming rises with support for exclusions, providing indication that "emotional" arguments for divestment may not be the most optimal method to convert "sceptics" to "devotees".

Finally, we show indicative findings that divestment preferences are associated with perceptions of institutional Environmental, Social and Governance (ESG) priorities. The proportion of cluster members who believe that their institution places higher importance on ESG factors than peer institutions and other investor categories increases with group support for negative sector screenings, and vice versa.

Our respondents tend to work in the financial and/or investment industries. The majority of their institutional headquarters are located in Europe, with the UK being the most represented country. We also document that "sceptics" tend to be older and consequently have longer investment-related experience than the other two groups.

The next section reviews the relevant literature in the field. Section 3 describes the survey, and Section 4 documents and discusses the survey results. Section 5 concludes the paper.

2 Related Literature

In this section we review the literature on divestment and exclusion, and describe the recent literature on survey evidence on responsible investing.

2.1 Reasons to exclude

One reason to engage in divestments is to harm excluded firms and force them to change their behaviour. Historically, in the 1960-80s, a comprehensive divestment campaign targeted companies doing business in South Africa during the Apartheid regime in the country. However, analysis by Teoh, Welch and Wazzan (1999) examine corporate divestment from South Africa and find that it had little impact on firm valuations or on the general South African capital market. More recently, Atta-Darkua (2020) provides evidence that firms negatively screened by the Norwegian Sovereign Wealth fund experience a negative return impact around the exclusion announcements.[12] Theoretically, Heinkel, Kraus and Zechner (2001) build a model where divestment increases cost of capital for firms. Companies then alter their behaviour if this is cheaper than the rise in cost of capital. In contrast, Davies and Van Wesep (2018) argue that divestment can be ineffective in the long run if managers are motivated by long run profitability and stock returns. This is because standard manager compensation methods such as stock options can be more profitable when prices are depressed in the short run, which can be a result of divesting activity. At the same time, Durand and Vergne (2015) provide evidence that media stigmatization can affect firm behaviour. They analyse diversified firms with exposure to the arms industry and show that increasing media criticism of the companies' arms divisions in the media increases the probability that firms divest their divisions. In a related vein, Homanen (2018) provides evidence that banks involved with the controversial Dakota Access Pipeline suffered significant decreases in deposit growth. The results suggest that firm depositors can behave in a coordinated fashion and thereby punish activities with which they disagree.

Sector exclusions can also be a form of risk management performed by investors. In fact, activists for divestment have claimed that fossil fuel reserves will become stranded assets[13] in the future.[14] Therefore, the argument is that in order to avoid the risk of poor returns in the future, investors should divest from these stocks in the present. This could be due to regulatory risks and/or the potential of new products (such as renewables) to displace them. Historically, the transportation industry has experienced a number of industry rises and declines, from canals

[12] Exclusion announcements are announced following the physical divestment of the Fund. Therefore, the measured return impact is the result of other investors' reactions.

[13] Stranded assets can be defined as "assets that have suffered from unanticipated or premature write-downs, devaluation or conversion to liabilities." (Maynard and Bordon (2017))

[14] For example, Shin Furuno from 350.org: ""European and American financial institutions are moving quickly not only to restrict new finance to coal projects but to divest from all coal related companies, in recognition of the risk that coal will become a stranded asset.", see https://350.org/press-release/energyfinanceinjapan2018/

being replaced by railways that in turn faced stiff competition from road transport (see Nairn (2002)). Divestment by other investors can also be seen as a threat to the prices of targeted stocks (Ansar, Caldecott and Tilbury (2013)) as it has the potential to depress them.[15] However, even in the absence of apparent future threats to particular sectors, there can still be a risk management case for divestment. Gintschel and Scherer (2008) argue that the revenue exposure which some sovereign wealth funds have to oil can result in a different optimal asset allocation for their portfolios. Retail investors could also consider company or sector divestment in order to account for the employment-related risks which they may face.[16] In the past, pension funds (Meulbroek (2005)) and employee pension 401(k) pension accounts[17] (Benartzi (2001)) had been found to allocate high levels of portfolios to company stock.[18]

Another argument for exclusions could be that it may help attract investors. There is some evidence to support such an idea. For example, Hartzmark and Sussman (2018) examine the introduction of sustainability categories in Morningstar fund data, which resulted in net outflows from low sustainability funds and inflows to high net sustainability funds. Therefore, some investors seem to value sustainability. Furthermore, Ceccarelli, Ramelli and Wagner (2019) show that funds which are close to gaining Morningstar's Low Carbon Designation adjust their holdings towards lower fossil fuel involvement. Such adjustments increase their chances of gaining the Low Carbon designation, which was associated with an increase in fund assets.

Investors' moral, cultural and religious beliefs can also affect how they construct and manage portfolios. For example, Nilsson (2008) examines how investors' pro-social attitudes towards Socially Responsible Investing (SRI) are associated with portfolio allocations to SRI funds. The conclusion is that both "altruistic" and "profit-oriented" factors play a role. Furthermore, investors who find social, ethical and environmental (SEE) issues relatively more important, and feel that their investment decisions can make an impact, have higher proportional allocations to SRI funds. Furthermore, investors conforming to Islamic finance cannot invest in firms in the alcohol, pork or gambling sectors (Ibrahim (2007)).

Investors could also face reputational risks when they invest in sectors which may be seen as running contrary to their mission. This can be the case even if the investments are in

[15] For example, see evidence by Atta-Darkua (2019)

[16] Intuitively, if employees are more likely to become unemployed when the company or sector is performing poorly, a total portfolio hedging argument would argue for under-allocation to company stock.

[17] "A 401(k) is a retirement savings plan sponsored by an employer", Source: https://guides.wsj.com/personal-finance/retirement/what-is-a-401k/

[18] Benartzi (2001) argues that this is particularly puzzling given the likely positive association between the returns on company stock and on human capital.

investment funds, whose direct investments may not be monitored by the investor. For example, the Church of England faced backlash and embarrassment when it emerged that part of its portfolio was indirectly invested in a prominent payday lender in the UK.[19] The revelation came after the Church's leader, the Archbishop of Canterbury, had criticized the company's practices in the press and vowed to work on putting them out of business. The Church ended its investment in the company following the criticism.[20] While a strategy aiming to avoid reputational risks would argue against such controversial investments, theoretically there can be a case to engage in them in order to achieve "mission hedging". Roth Tran (2018) argues that it may be preferable for endowments to invest more heavily in firms whose activities are contrary to the organisation's mission as opposed to divesting. Then they can benefit from higher returns when there is a higher need for their services. For example, a charity cancer combatting lung cancer investing in tobacco firms would be able benefit from having more resources to achieve its mission when tobacco stocks perform well. However, Baker, Hollifield and Osambela (2019) argue that the hedging argument may not prevail if investors coordinate investment strategies to internalise the negative externalities of polluting firms. This is also the case if they incur nonpecuniary disutility from holding firm stock. The first motive can explain divestment behaviour only when a large proportion of investors engages in coordinating behaviour. However, this is not a necessary condition for the disutility argument, which is comparable to taxing a proportion of investors for holding shares in the designated firms.

Nagell (2011) argues that one aspect of investor responsibility is "taking steps to reduce the risk that an investment directly or indirectly contributes to harm". This motive can also be framed as avoiding complicity for undesirable actions of portfolio firms and can also lead to investors engaging in exclusions. However, the author notes that it is challenging to determine the conditions under which investors could be considered accountable for firm behaviour. It is difficult to establish complicity with either a counterfactual (what would happen if the investor did not own shares) or a balance of probabilities method (does owning shares change the probability of the firm causing harm). As industry participants frequently point out, divestment affects shares trading in the secondary markets. Since firms primarily raise funds via initial shares offerings, they are likely to be minimally financially impacted by sell-offs in the

[19] Definition of pay day loan from Investopedia: "A payday loan is a type of short-term borrowing where a lender will extend high-interest credit based on a borrower's income and credit profile. A payday loan's principal is typically a portion of a borrower's next paycheck. These loans charge high-interest rates for short-term immediate credit. These loans are also called cash advance loans or check advance loans.", source: https://www.investopedia.com/terms/p/payday-loans.asp

[20] https://www.bbc.co.uk/news/business-28257351

secondary markets.[21] Nagell (2011) notes that another argument for complicity would rely on the argument of Kutz (2007) that complicity lies in "the individual intention to take part in the collective act". However, in this case, it is hard to place responsibility on shareholders for management behaviour due to the management structure of corporations which imposes a separation of ownership and control. and Kutz (2007) himself argues that the link cannot be made in cases of firms. Nevertheless, some investors can consider themselves complicit in the actions which their portfolio firms make.[22]

Certain investor characteristics can impact the portfolio decisions of investors. For example, Starks, Venkat and Zhu (2017) show that investor horizon is positively associated with preferences for high-ESG stocks.

2.2 Alternatives to exclusion

Impact investing is a socially responsible strategy which focuses on allocating resources to investments with externalities which inventors want to promote. Therefore, impact investing can be viewed as the opposite of negative screening where the aim is to withhold resources from firms. Chowdhry, Davies and Waters (2018) build a model where impact investors allocate funds to firms with considerable social value. They then use their ownership stakes to incentivize profit-minded managers to follow social goals in addition to their profit maximizing objectives. In the venture capital universe, Barber, Morse and Yasuda (2018) examine the performance of private equity firms and argue that investors are willing to accept lower returns

[21] E.g. See https://www.pragcap.com/my-view-on-esg-investing/ , accessed in July 2019

[22] As Nagell (2011) notes, the original Norwegian Ministry of Finance commissioned Graver report ((Graver, Bergo, Cappelen, Lohman, *et al.* (2003)), which proposed ethical guidelines for the Norwegian GPFG (Government Pension Fund Global), the largest sovereign wealth fund in the world[23,] argues that "*Even though the issue of complicity raises difficult questions, the Committee considers, in principle, that owning shares or bonds in a company that can be expected to commit grossly unethical actions may be regarded as complicity in these actions.".* The committee's proposed ethical guidelines fed into government-proposed ethical guidelines which argued that "The Fund should not make investments which constitute an unacceptable risk that the Fund may contribute to unethical acts or omissions"[24]. However, the Fund's opinion on the matter may have evolved over time since the most recent ethical guidelines are milder in their interpretation only focusing on company contributions to products or conduct which falls outside the guidelines and not explicitly drawing a connection to complicity by the Fund.[25] Furthermore, the latest ethical guidelines are currently under review, as of April 2019[26.]

[23] See, for example, the ranking of the Sovereign Wealth Fund Institute: https://www.swfinstitute.org/fund-rankings/sovereign-wealth-fund , accessed in July 2019

[24] Ethical Guidelines for the Government Petroleum Fund – Issued 22 December 2005, https://www.regjeringen.no/en/dep/fin/Selected-topics/The-Government-Pension-Fund/Ethical-Guidelines-for-the-Government-Pension-Fund---Global-/the-ethical-guidelines.html?id=434894, link no longer active as new guidelines have been enacted. Old guidelines. Quoted paragraph cited in Halvorssen (2011) and https://whoprofits.org/flash-report/a-case-study-the-norwegian-governments-pension-fund/ , accessed July 2019

[25] "Companies may be put under observation or be excluded if there is an unacceptable risk that the company contributes…", link: https://etikkradet.no/files/2017/04/Etikkraadet_Guidelines-_eng_2017_web.pdf, accessed in July 2019

[26] https://www.regjeringen.no/en/aktuelt/utvalg-skal-vurdere-de-etiske-retningslinjene-for-spu/id2640389/, Accessed July 2019

for impact funds. In contrast, for mutual funds, Geczy, Stambaugh and Levin (2005) argue that the cost of investing in socially responsible funds is relatively low for an index investor.

Divestment is not the only option when investors are dissatisfied. They can also use voice (engagement) or remain passive (Hirschman (1971))**.** There is evidence that successful engagement with companies on corporate social responsibility (CSR) (Dimson, Karakaş and Li (2015)) and environmental and social issues (Dimson, Karakaş and Li (2018)) can improve firm performance. Similarly, Hoepner, Oikonomou, Sautner, Starks, *et al.* (2018) find decreased downside risk associated with successful environmental, social and governance (ESG) engagements. Smith (1996) examines responses to corporate governance-aimed activism by CalPERS[27] and find improved shareholder value for firms adopting proposed changes or agreeing a resolution with CalPERS, but no effect on firm performance. Broader investor activism also seems to have benefits. Becht, Franks, Grant and Wagner (2017) show positive returns to hedge fund activism. Similarly, Becht, Franks, Mayer and Rossi (2008) document improved performance stemming from engagements for an activist investor (Hermes UK Focus Fund).

2.3 Sector Returns

As part of our survey, we examine respondent beliefs about selected sector risk and returns for a selection of controversial and non-controversial sectors. Empirically, Hong and Kacperczyk (2009) provide evidence that "sin" stocks outperform comparable "non-sin" firms. They define "sin" stocks as those in the alcohol, tobacco and gaming industries, which we refer to as socially controversial. Similarly, Fabozzi, Ma and Oliphant (2008) show that portfolios of "sin" stocks[28] outperform common benchmarks. In contrast, Blitz and Fabozzi (2017) argue that after adjusting for the Fama French five factors (Fama and French (2015)), the outperformance of "sin" stocks disappears.

Controversial stocks earning higher returns is also consistent with work by Carlin, Longstaff and Matoba (2014). They show that there is a positive risk premium for disagreement and that stocks with higher investor differences of opinion are associated with higher expected returns and higher return volatility. Fama and French (2007) also note that disagreement about the distribution of future asset payoffs can give rise to deviations from CAPM. Miller (1977) argues that in the presence of short selling constraints, higher disagreement about stock prices results in relatively high prices. This is because optimists can buy shares while pessimists

[27] California Public Employees' Retirement System: https://www.calpers.ca.gov
[28] They also include stocks in the weapons and biotech alterations industries in their definition of sin stocks

cannot express their negative price opinions, Furthermore, future returns are expected to be low. Chen, Hong and Stein (2002) also argue that when investor breadth is reduced[29] future returns would be lower. However, dispersion of return beliefs signifies higher return uncertainty, which risk averse investors would need to be compensated for. If this mechanism dominates over the optimism mechanism then returns will also be higher in the longer term (Atmaz and Basak (2018)).This could especially be the case for controversial stocks which are not patronised by certain norm-constrained investors as the remaining investors may already be taking larger positions in such stocks than they would if norm-constrained investors were not blacklisting them.

2.4 Surveys

Other papers have also employed surveys as a method to gain an insight into the perception and behaviour of investors in the responsible investing space. Brodback, Guenster and Mezger (2019) provide survey evidence that altruism is positively associated with the decision to invest socially responsible. Amel-Zadeh and Serafeim (2018) examine how investors make use of ESG data and their motivations to do so. Krueger, Sautner and Starks (2018) document that investors believe that climate change regulation risks have already began to affect investment portfolios. Ilhan, Krueger, Sautner and Starks (2019) survey investors on firm climate risk disclosures. They find that respondents who consider current climate risk reporting to be deficient believe that there are higher levels of mispricing in the equity markets. Furthermore, they show that the majority of investors report preferring risk management and engagement tactics compared to divestment as a strategy to combat climate risks. In contrast, in this paper we discuss how respondent climate change beliefs are connected to expected sector performances. McCahery, Sautner and Starks (2016) document the corporate governance preferences of institutional investors including their opinions the factors which determine the effectiveness of the threat of exiting companies. Riedl and Smeets (2017) combine survey, experimental and administrative data and show that socially responsible investment decisions can be explained by social preferences and signalling. In contrast, financial incentives play a smaller role since investors are prepared to achieve lower financial performance.[30]

[29] fewer investors have long positions in stocks

[30] More broadly, Dorn and Huberman (2005) combine survey and trading data and demonstrate that more risk tolerant and less experienced investors have less diversified portfolios and higher portfolio turnover. Venture capitalists have also been surveyed on their decision-making process in sourcing, evaluating and selecting investments (Gompers, Gornall, Kaplan and Strebulaev (2019)) as well as on their practices on firm capital structure, governance and value creation (Gompers, Kaplan and Mukharlyamov (2016)). Finally, in corporate finance, Poterba and Summers (1995) conduct a survey on CEOs on their firm time horizons and the hurdle rates they apply to cash flows. Similarly, Westphal (1999) combines top management and outside director survey data on CEO-board relationships with archival data on CEO

3 Survey Description

The survey was designed to explore industry professionals' perceptions of the various reasons behind sector exclusion and their attitudes towards them. Furthermore, it also includes questions on the financial performance of selected sectors compared to the broad market performance. Attitudes towards global warming are also explored. Finally, institutional demographic data is collected in order to classify responses into relevant categories.

Initially, the survey was piloted on post-experience graduate-level[31] students attending an elective on Investment Management in Judge Business School (44 responses). Questions were then adjusted for the next iteration based on the answers and feedback provided by the students. The adjusted survey was taken to conferences in Amsterdam and Brussels (N = 70) and a research student sample[32] at Judge Business School (N = 12). The survey was completed by further 200 investment professionals. The total current sample from the professional conferences is 263 and the total student sample is 63.[33]

There is a potential for selection bias in our survey, since respondents who feel more strongly about divestment could be more likely to fill in the survey. In order to provide representation to a broader range of views, in addition to the overall results we group professionals into clusters based on their exclusions views. We then tabulate the results by clusters, so that we can demonstrate the views of a range of participants.

4 Survey Results

4.1 Sector exclusion views

The first question in the survey asks respondents to evaluate different statements in terms of how useful sector exclusion would be to achieve them ("Would you consider sector exclusion to be a useful tool for ...?"). **Table 2** displays the answer choices and scores. The choices can be combined into groups depending on the attitudes to divestment which they aim to probe. Two options refer to it as a tool for achieving a positive impact ("Addressing climate change issues" and "Putting pressure on companies to improve practices"). Three statements

compensation and performance and board composition and show how social ties can affect frequency of advice to CEOs and firm performance.

[31] MBA and MFin (Master of Finance)

[32] Finance research master students

[33] The initial conference sample of 270, becomes 263 when we remove responders from the professional conferences who identify as students. In accordance, the total student sample rises to 63 when self-identified students from other events are included.

refer to negative screenings as a risk management measure ("Addressing industry regulation risks", "Addressing industry-wide setbacks", and "Addressing risks and holdings outside of portfolios"). One alternative considers them as a branding tool ("Attracting funds from ethically concerned investors") and two others frame it as a tool to avoid criticism ("Addressing investor reputational damage") or guilt\complicity ("Addressing responsibility for climate change harms"). Finally, we also ask whether they consider exclusions to be a useful tool to express their beliefs connected to morality ("Conforming to moral beliefs") or religious or cultural norms ("Conforming to religious or cultural beliefs"). The answers were scored on a Likert scale,[34] using 1 for Strongly Disagree and 5 for Strongly Agree. "Don't know", answers left blank and cases where multiple answers are ticked for the same question are omitted. Using the responses, we calculate an average score for the support each statement has. A score of 3 would indicate neutral support, higher score would indicate that on average respondents viewed the statement positively, and a lower score would indicate the opposite. A standard deviation is displayed to show the level of variation in answers.

Panel B shows these average scores for the professionals' sample, ordered from highest to lowest ranking. "Attracting funds from ethically concerned investors" (average score of 4), which is related to the role of sector exclusion as a branding tool was the most supported tool. The role of exclusions to attract investor funds is supported by empirical findings (see Hartzmark and Sussman (2018), Ceccarelli, Ramelli and Wagner (2019)). Following it, statements which received average scores of above 3.5 belonged to the groups related to using divestments to conform to beliefs, achieving a positive impact, or avoiding criticism or guilt. The least supported uses, which received scores of below 3.50, were all connected to portfolio risk management ("Addressing industry regulation risks", "Addressing risks and holdings outside of portfolios", "Addressing industry-wide setbacks").

Figure 1 shows the mean scores and variation of opinion "frontier" for the statements.[35] In general, statements with higher levels of mean support tend to have higher variation of opinion (standard deviation of responses). A particular outlier is statement 7 which examines exclusion as a branding tool and has a relatively high score and low dispersion of opinion. Statements 3, 6, and 7, which are connected to branding and risk management, tend to have relatively low mean scores and variation in scoring and fall below the regression line. Therefore,

[34] For a description, see Boone and Boone (2012)
[35] 95% Confidence window constructed using bootstrap, n = 10,000

professionals are relatively more unanimous in their opinions on risk management and branding-motivated exclusions which they rank bottom and top, respectively.

Turning back to **Table 2**, in Panel C, the similarities among the statements in the assigned groups become easier to examine. In the Panel we display the proportional support at each level (1 to 5, Strongly disagree to Strongly agree). Statement #7 (branding tool) is the only statement to achieve over 40% of professionals who strongly agree with it (43%). The statements related to risk management have similar answer distributions, suggesting our grouping is consistent.

Panel D of **Table 2** shows the mean scores from the student sample. We tabulate the results for the statements where we have more than 50 responses. This results in keeping 60% of the statements we have for the professionals' sample since some of the statements were added following the initial pilot study. Overall, students seem mildly supportive of divestments, with average scores ranging from 3.19 to 3.48. Unlike in the professionals' sample, they are more sympathetic towards a risk management argument. Using exclusions to address regulation risks receives the highest support, while the least popular motivation is addressing climate change issues.

The correlations among statements tend to be high for the professionals (see correlation matrix in Panel E). However, in the Internet Appendix (**Table B. 1**) we show that statements have marginally lower correlations with outside of group statements than with all statements (Panel B).[36]

The relatively high correlations could indicate that respondents feel similarly about the different statements, Therefore, next, we examine if this is the case or whether there are groups with differing opinions. We find that professionals can be assigned to groups depending on their sector exclusion beliefs. This also allows us to present the rest of the results for each cluster of opinion. We use a k-means clustering algorithm to classify the respondents into categories based on their expressed preferences across statements 1 to 10 of Q1.1. The Internet Appendix describes the clustering procedure for the professionals' sample in more detail. It aims to create groups with similar preferences. The cluster centroids are the mean preferences of a cluster member across the different statements.[37] These are shown in **Table 3**:

We have ordered the clusters from least supportive of the usefulness of divestments to most supportive. Panel A clusters the professional sample. The "sceptics" group contains 34 respondents who somewhat disagree that divestments are a useful tool across all reasons

[36] Statement 7 (Attracting funds from ethically concerned investors) is the only one in its group so both correlations are the same for it.

[37] Centroids can also be described as central points of the cluster preferences

suggested in the survey. The 72 members of the "questioners" cluster are ambivalent about the usefulness of negative screenings, but somewhat agree that they can be a branding tool and used to express beliefs. Finally, the "devotees" group contains 145 respondents who somewhat agree that sector exclusions can be a useful tool to achieve all statements. We have a tilt towards approving of divestments in our sample. Therefore, we will use the cluster results to present the opinions of professionals whose views are less popular, such as those of the "sceptics". Such opinions may well be more prevalent in the general population than they are in our sample, where we only have 34 respondents who hold them.

Panel B performs the same procedure for the student sample, using the six statements where we have high response coverage from Panel D of **Table 2**. Students can be grouped into clusters similar to those of the professionals ("sceptics", "questioners", "devotees"). The proportion of the three groups in the student sample (14%, 25%, 60%) is similar to the proportions of the professionals (14%, 29%, 58%). However, there can be multiple explanations for this consistency. On one hand, it could be the case that graduate students with finance knowledge have similar overall exclusion views to those of professionals. On the other hand, the survey may be more appealing to certain profiles than to others, resulting in their over or under-sampling in the survey for both cohorts. For the remainder of the paper we focus on the professionals' sample, since in practice they are likely to have a more substantial impact on divestment decisions within organisations than the students.

4.2 Sector risk and return opinions

We ask professionals to answer question about their views on the risk and return properties of several sectors. Five of the them could be considered controversial (Alcohol, Coal, Mining, Oil & Gas and Tobacco). Of those, three could be considered environmentally controversial (Coal, Mining, and Oil & Gas) and the other two can be considered socially controversial (Alcohol and Tobacco). Two sectors have not currently been targeted for divestment (Consumer Goods and Technology). Results are displayed in **Table 4**, **Table 5**, and **Table** 6. We discuss the main results and also split the results by cluster in order to explore the possibility that return and risk opinions may vary depending on overall exclusions preferences. We do not aim to suggest that one causes the other, since the direction of causality could go both ways. Instead, we explore how differences in negative screening opinions are associated with sector risk and return beliefs.

4.2.1 Sector Returns estimates (Q1.3)

Professionals shared their opinions on the returns of sectors in Q1.3 "How would you expect the stock market returns from each of these sectors to compare to overall market returns over a 10-year period?". Responses were coded from 1 to 3, where 1 is "At least 1% a year < market", 2 is "About the same" and 3 is "At least 1% a year > market". Empty, unclear[38] and "Don't know" answers were omitted from the analysis. The results are summarised in **Table 4** and a full breakdown is shown in the Internet Appendix (**Table E. 1**). We classify mean responses within the 1.5 to 2.5 range as "same" as the market, responses above that as "higher", and those below as "lower". In the total sample (Panel A), Technology was expected to outperform ("higher", mean > 2.5), while Coal was expected to underperform ("lower", mean < 1.5). All other sectors were expected to perform broadly in line with the market (mean scores between 1.5 and 2.5). The summarised results are supported by the proportional breakdowns shown in the Internet Appendix, where 79% of respondents expect Technology stocks to outperform the market, while 74% expect the Coal to underperform it. This belief is consistent across clusters (Panels B to D). Therefore, it seems that returns expectations are not affected by the exclusion preferences.

We also display standard deviations of these estimates.[39] The dispersion of opinion about returns is the lowest for non-controversial (Consumer Goods and Technology) sectors. Again, this holds for the full sample and across all clusters of opinion. Carlin, Longstaff and Matoba (2014) argue that investor disagreement is a contributing factor to higher expected stock returns. Therefore, our finding that controversial stocks have a higher divergence in expected returns provide support for empirical results that they tend to outperform non-controversial stocks (Hong and Kacperczyk, 2009)). In consequence, while respondents do not report expectations that controversial sectors will outperform noncontroversial sectors ex-ante, the fact that they tend to disagree the more about their returns relative to those of controversial sectors could be a contributing factor to controversial sector outperformance ex-post.

In Panel A of **Table 7** we show how these expectations compare to the sector returns in four markets over the past 10 years. We select the World, European, USA and UK markets. While there are overlaps among the four data series,[40] they represent markets which are likely to be followed by our respondents. The UK and European markets are chosen specifically in

[38] Selecting more than one response, response tick being between multiple answers, etc.
[39] However, these are not strictly defined as the data is not continuous.
[40] UK, European and USA stocks will be contained in the World index and UK stocks are part of the European market.

mind of the UK and European bias in the sample (see the demographics in Panel C of **Table 11**). We describe the specific data series we use for each market in the Internet Appendix. The sources we use are French (2019), FTSE Russell (2019), and Thomson Reuters (2019).[41]

The return expectations of the professionals with respect to Coal and Technology are consistent with the returns data. Historically, Coal underperformed in all markets where we have data,[42] and Technology outperformed in all four markets. However, expectations are not fully based on past returns. Oil & Gas stocks also under-performed in all four markets, but this is not reflected in return expectations. Given that Alcohol stocks outperformed in three out of the four markets we study, respondents could have also expected the sector to out-perform, but they did not. Therefore, it seems that respondents are not predicting future returns solely based on past performance.

In summary, professionals do not expect controversial sectors to outperform non-controversial sectors. However, they have lower disagreements of opinion about expected returns of non-controversial relative to controversial sectors, which could result in such outperformance in practice. These return expectations do not seem to be connected to divestment opinions. Return expectations do not fully reflect past return performance data.

4.2.2 Sector Risk estimates (Q1.5)

Next, in Q1.5 we asked respondents about their opinion on the variability of sector returns ("How would you expect the volatility of each of these sectors (annualised standard deviation) to compare to market volatility over a 10-year period?"). Answers are coded in the same manner as Q.13 and summarized in **Table 5** (full breakdown in Internet Appendix (**Table E. 2**)). On average, Technology and the environmentally controversial sectors (Coal, Mining, Oil & Gas) are expected to have larger variation than the market (Panel A). Therefore, respondents do not seem to expect environmentally controversial sectors to be less risky in terms of standard deviations than the comparable non-controversial sectors. This is also the case for the "sceptics" group (Panel B). The number of controversial sectors expected to have a higher variation than the market falls with support for exclusions, with "questioners" predicting such outcomes for only two controversial sectors (Mining and Oil & Gas, Panel C), and "devotees" for only one controversial sector (Mining, Panel D). Therefore, support for exclusions does not seem to stem from an expectation that controversial sectors are more volatile than other sectors.

[41] We use the Beverages series to proxy for Alcohol sector in all three markets except the USA because an alcohol series was not available.

[42] We have no data for the UK Coal sector returns

Examining the historical variations in Panel B of **Table 7** shows that the majority of sectors have had a higher variation than the market in at least three out of the four markets we investigate. Consequently, an agent extrapolating the recent past into the future would have grounds to expect most sectors to have higher variation. Consequently, it seems that "sceptics" are the ones who appear to be most guided by the recent historic returns record, while "devotees" are least guided by it. We also document differences in the level of disagreement about expected standard deviations. While non-controversial sectors still have relatively low levels of disagreement, the results are not as strong or consistent across groups as for the returns disagreement.

In summary, professionals expect Technology and environmentally controversial sectors to have higher variations than the market. Higher support for exclusions is associated with a lower number of controversial sectors expected to have high return variation. Therefore, respondents more in favour of exclusion are not more likely to expect controversial sectors to be more risky (in terms of standard deviations) than non- controversial sectors. Furthermore, respondents. who are more supportive of exclusion also tend to rely less on past sector performance to predict future return variations.

However, since standard deviation is a symmetric measure which captures both negative and positive return variation, next we examine perceptions of negative return variations.

4.2.3 Sector Negative Performance Risk estimates (Q1.4)

Finally, we examine the sector negative performance risk estimations of professionals, by looking at their answers to Q1.4 "Over each of 2020, 2021, ….2029, what is the worst 1-year under-performance relative to the market that you expect to observe for each sector? (maximum absolute difference between market and sector returns, when the sector return is lower than the market return)". The answers are tabulated in **Table** 6 (full breakdown available in Internet Appendix (**Table E. 3**)).Since they contain subsequent ranges of negative performance return outcomes, with the initial and final range having different lengths from the middle range, we explore two potential mappings. The first one is categorical, where the higher the range the higher the categorical number it is assigned. The second one is based on each range's mid-point[43] (displayed in Panel A). Since both mappings result in the same overall ranking of adverse performance risks we make use of the first mapping technique when describing the results. We summarise them by assigning "base" value to results where the mean

[43] except for the last range, which is open, where the mid-point is selected based on the range on the previous three answer options

categorical ranking is between 1.5 and 2.5, "low" if below 1.5, "high" if it is between 2.5 and 3.5, and "very high" is it is above.

Overall, Coal is expected to have high negative performance risk relative to the other sectors. This pattern is broadly repeated across most groups. Adverse performance risk expectation for Coal are the most pronounced for "sceptics". This can be seen clearly in the Internet Appendix (**Table E. 3**)) where a quarter of "sceptics" expect Coal to have an outcome in the worst category. Among the clusters, "Questioners" are the only ones to also expect Mining to have "high" relative negative performance risk.[44] Devotees expect most sectors to have similar adverse performance risk, falling into the "base" category.[45]

Examining the results using 10-year historical data across our four markets, in Panel C of **Table 7**, Coal has had the strongest negative performance return risk compared to the market, and in most cases falls into the "very high" category. Sceptics come the closest to estimating adverse performance risk similar to its historic performance. "Questioners" are the only group to identify Mining as having a similar negative performance risk to prior outcomes. "Devotees" seem the least guided by the historic record.

In summary, exclusion preferences seem connected to adverse performance risk estimates. "Devotees", who tend to support exclusions, nevertheless do not expect controversial sectors to have higher risks than non- controversial sectors, despite some controversial sectors having experienced high historical underperformances relative to the market.

4.2.4 Risk Return Frontier

We combine the return and risk estimates of respondents to show how sectors are mapped on a risk and return frontier by mimicking a mean variance portfolio optimization framework (see Markowitz (1956), Markovitz (1959) and Sharpe (1970)). The risk and return preferences measured via mean returns (Q1.3) and standard deviations of return (Q1.5) are displayed in **Figure 2**. Similarly, in **Figure 3** we plot returns (Q1.3) versus negative performance risk (Q1.4). Using both metrics of risk, for the total sample (Panels A), the two non-controversial sectors, Consumer Goods and Technology, strictly dominate the others in terms of achieving the highest return for the lowest risk. Therefore, they form part of a frontier of superior risk return profiles. Across the clusters, socially controversial sectors (Alcohol and Tobacco) also form parts of the frontier in some cases. However, environmentally controversial sectors (Coal, Mining and Oil & Gas) are consistently dominated by the non- controversial sectors.

[44] and are close to expecting Oil & Gas to also have "high" risk (score of 2.5 on the border)
[45] For Coal their expectations are closest to the "high" category (2.49)

Therefore, the belief that environmentally controversial sectors (Coal, Mining, Oil & Gas) offer a poor risk return trade-off is independent of respondent beliefs about the usefulness of divestments.

4.2.5 Summary of risk and return opinions

In summary, it seems that professionals do not expect controversial sectors to offer superior performance to non-controversial sectors, even if they are exclusion "sceptics". However, they exhibit lower dispersion of return opinions for non-controversial compared to controversial sectors for the total sample and across the three groups we examine. This disparity in disagreement can in practice lead to superior controversial stock returns. Furthermore, there is a connection between support for exclusions and risk expectations. However, this may not go in the expected direction. Respondents most in favour of exclusions ("devotees") expect the least negative risk outcomes for controversial sectors relative to non-controversial sectors. Furthermore, "Devotees" seem to form risk beliefs least consistent with the recent historic profiles of sectors and also tend to anticipate the lowest levels of adverse performance risks from controversial sectors. Finally, we examine the efficiency frontiers which can be formed based on risk and return expectations. Irrespective of exclusion preferences, on average respondents expect environmentally controversial sectors to be dominated by non-controversial sectors.

4.3 Climate change views

In this section, we surveyed professionals about their views on global warming. We aim to determine if they are associated with exclusion preferences. We adapt questions from the Yale Climate Change in the American Mind Survey (Leiserowitz, Maibach, Rosenthal, Kotcher, *et al.* (2019)) and compare our results to those in the Yale survey (November 2018 wave). We do not anticipate the results to be the same since their sample is of the broader US population and we survey industry professionals. Our sample has not restricted the geography of respondents by design. However, we have distributed the survey in the UK, Europe and Hong Kong which in practice has restricted the respondent backgrounds.

4.3.1 Global warming beliefs

The first question (Q2.1, in **Table 8** Panel A) asked if global warming is happening and record almost universal belief that in it, among professionals who expressed an opinion (98% Yes in total sample). Support is at least 94% among all clusters. This is in contrast to

respondents in the USA, as measured by the Yale survey, where comparably only around 84%[46] answered in the affirmative.

In the second question (Q2.2 also in Panel A) we asked was which factor is the major cause of global warming, assuming it is happening. A large majority reported that it is mostly caused by human activities (87%). Across the groups the level of support for that belief was at least 79%. "Sceptics" have the highest level of support for the belief that natural changes for the environment are to blame (21%). Even so, four out of five "sceptics" still consider human activities to be the main cause. The level of support for the belief that human activities are responsible (87%) in our survey is higher than that in the Yale survey. There comparable[47] results show that among the USA population 68% support human activities as the driver while 25% support natural changes in the environment.[48] Therefore, our respondents both believe that global warming is happening and mostly consider humans responsible.

Next, we enquire about the potential impacts of global warming (Q2.4 "When do you think global warming will start to harm people?"). We display the answers in Panel B. Our respondents generally expect negative consequences of global warming to materialise in the near term. More than half (57%) think that it has already started harming people. This is followed by almost a third (32%) who think it will start harming people in 24 or less years (summing the next two categories). Only 10% anticipate negative effects in 25 or more years (summing the last two categories). Examining the results by cluster, support for exclusions is negatively associated with the belief that global warming is harming people at present.[49] In contrast, it is positively associated with believing that climate change will start harming people in 24 years or less.[50] We achieve broadly similar results if we summarise the parentage beliefs into average preferences using two weighing schemes (Internet Appendix, **Table G. 1**). Therefore, divestment "sceptics", while not in support of exclusions, do seem to be aware of the potential harms of climate change.

The Yale survey contains a similar question, which asks specifically about the United States (**"**When do you think global warming will start to harm people in the United States?**").** We have altered the time periods in our survey so the intervals are not directly comparable for most

[46] Of those who express and opinion - ignoring the "Don't know" answers and only considering the "Yes" and "No" responses.
[47] Results adjusted to add up to 100%
[48] Omitting 8% selecting "Neither because global warming isn't happening"
[49] falling from 77% for "sceptics" to 51% for "devotees"
[50] rising from 10% for "sceptics" to 38% for "devotees"

options. Nevertheless, with some adjustments[51] we calculate that 56% of their respondents also believe that global warming is affecting people now, which is similar to our results.

After documenting that despite their divestment views, respondents largely believe in global warming, consider it to be mostly caused by humans, and tend to expect it to have started to adversely harm humans, we inquire about their emotional attachment to the subject.

4.3.2 Emotional attachment to global warming

In **Table 9** we tabulate answers to Q2.3 (How concerned are you about global warming?) and Q2.8 (How strongly do you feel each of these emotions when you think about the issue of global warming?) to examine emotional loadings on the subject of global warming. The answers are scored on a Likert scale from 1 (Not at all) to 4 (Very). We classify responses in the middle as "base" (between 2 and 3), those below 2 as "low", those between 3 and 3.5 as "high", and those above 3.5 as "very high" (in the Internet Appendix (**Table G. 2**) we show proportional support for each statement).

The professionals load relatively "high" on concern, while the loadings on the other emotions are lower ("base" category). Across the clusters, concern rises to "very high" for "devotees". "Questioners" also experience helplessness to a relatively higher level ("high" category), and for "devotees" the emotion is also borderline in the "high" category (2.99). Therefore, emotional attachment to global warming seems to increase with support for exclusions. Notably, given that "sceptics" have the lowest loadings across all emotions connected to global warming, campaigners urging divestment may find it hard to convert them to "devotees" via emotional arguments.

In comparison, among the respondents in the Yale study a lower portion of respondents are somewhat or very worried about global warming (69% vs 93% in our survey). Therefore, using our scoring mechanism their loading on worry[52] would be "base". The loadings on all other emotions would also fall into the "base" category.

One caveat of this analysis of emotions is that we cannot distinguish if cluster members load in the same way on these emotions unconditionally as well as conditionally on global warming i.e. whether, for example, they are more hopeful in general or just with respect to global warming.

[51] if we remove the "Never" responses in the Yale survey in the same manner we exclude "Not Applicable" and "Don't knows" in ours. If we keep the "Never" category, the figure is 48% (% now)

[52] In our survey we use "concerned" instead of "worried"

4.3.3 Top of mind of global warning

Finally, we enquire over our respondents' exposure to the topic of global warming (**Table 10**). We ask how often respondents discuss it with friends and family (Q2.5), with work colleagues (Q2.6) and how frequently they hear about it in the media (Q2.7).

Professionals report discussing global warming with friends and family and with their colleagues to a similar extent. In both cases about a fifth (21%) discuss it at least once a week and a quarter discuss the issue at least once a month. This is similar for our groups which support exclusions. In contrast, "sceptics" report higher near-term exposure (weekly) via discussions with work colleagues (30%) than with friends and family (21%). The Yale survey includes a question about exposure to global warming via discussions with friends and family. However, we adopt a different Likert scale[53] so the results are not directly comparable theirs.

Exposure to global warming in the media is frequent, with over half (56%) reporting hearing about it at least once a week and another 27% at least once a month. With minor adjustments to the Yale survey, to make their results comparable to ours,[54] we show that their sample reports lower media exposure. Only 38% are exposed to it via the media at least once a week, compared to over half in our survey. Another substantial difference is that 12% of their respondents have heard of global warming via the media less than once a year (including never) compared to 0% (1 answer) in our sample.

Therefore, it seems that global warming is an issue that our respondents are exposed to in their daily lives at a relatively high frequency.

4.3.4 Summary of climate change results

Professionals almost universally believe that global warming is happening, with high levels of support across all groups of exclusion support. Similarly, 87% consider human activities its major cause. Furthermore, more than half of our respondents (57%) deem it to be harming people at present, this rises to 77% among "sceptics".[55] Therefore, the large majority of our respondents are not climate change deniers. However, we do note differences in emotional attachment to the subject. "Sceptics" are the least emotionally attached to global warming. Therefore, "emotional" arguments on the topic may be less likely to persuade them to be supportive of divesting environmentally controversial sectors.

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[53] We choose to adopt the same Likert scale across questions Q2.5 to Q2.7 for comparability across the questions. The Yale survey uses "often", "occasionally", "rarely" and "never" as their scale for the friends and family question.

[54] Dropping the "Not sure/No answer" category and combining the "Once a year or less often" and "Never" categories into a "Once a year or less often" joint category

[55] It could, however, be the case that "sceptics" have a lower estimate as to the maximum damage which global warming can cause to humans than the other groups. Unfortunately, the questions in our survey do not allow us to determine this.

4.4 Respondent and institutional characteristics

In this section we document the institutional characteristics of our respondents and show how these correspond to the opinion clusters which we have constructed. Some of the questions borrow on those asked in the survey of Krueger, Sautner and Starks (2018). Since the data is self-reported it is likely that the figures and estimates reflect both the actual characteristics as well as the perception of the survey respondents about them.

4.4.1 Institutional and Individual Characteristics

First, we ask professionals what category best describes the institution they are employed in. We display the results in Panel A of **Table 11**. We have presented a number of categories (see the Q3.1 category in the survey in the Internet Appendix) and also allowed manual input where none of them apply.[56] For confidentiality reasons, we have tabulated cases where for the total sample there are at least five responses in a category. These cover 89.4% of our sample. The remainder comprises categories with four or fewer selections, or respondents who did not fill in the question. The majority of categories are connected to finance and/or the investment industry. The largest categories are financial planning/advisory (14.4%), mutual fund company (12.5%), consultancy (10.6%) and family office (9.9%). Similarly, in Panel B, we show the primary position of professionals. Again, we only display cases with five or more answers. 22% fall into the "Other" category, which is an amalgamation of positions without enough replies to have their own category and not similar enough to the other categories to be allocated to them. [57] The next top two categories are Financial Planner/Adviser (17%) and Analyst/Strategist (13%). Panel C displays the location of institution headquarters. The sample has a UK bias with 37.6% of professionals' headquarters being based in the country. The next largest countries are Norway (15%), Belgium (8%) and the USA (5%). Cluster members characteristics span the different institutional, occupational, and headquarters categories with no one category dominating a group. This suggests that institutions, occupations, and geographies contain members with varying exclusion opinions.

Next, in Panel D we display the age groupings of our sample.[58] Almost all are between 25 and 65 years old (96%). Among the clusters, "sceptics" tend to be older (68% are 45 years old or more) than the main sample, while "questioners" tend to be slightly younger (55% are 44 or younger). In the last Panel (E) we show self-reported years of investment experience. The

[56] The responses listed in the Other category are then allocated to their own category or put into one of the existing categories.
[57] For example: Sales, trustee, Investment Specialist, Fund adviser, etc.
[58] examining the respondents who filled in the question

professionals who reply (212, 81%) report on average 18 years of investment-related experience. “Sceptics”, who are the most mature as a group, also have the highest average investment experience (22 years). This is unsurprising, since mathematically older professionals have had more time in which to gain investment-related experience.

4.4.2 ESG beliefs and characteristics

In the next table, **Table 12**, we show the beliefs of professionals about the ESG preferences and characteristics of their institutions. First, we examine the answers to two questions regarding ESG factors. In Q2.21 we ask “What importance do your peer institutions (category selected above) place on Environmental, Social and Governance (ESG) factors compared to other investor categories?” and in Q3.22 we ask “What importance do your peer institutions place on ESG factors compared to your institution?”. The aim is to probe respondents’ beliefs about their own institutional ESG preferences by asking about their peer institutional preferences and how these relate to their institutions and other investor categories. We chose to use this indirect method to identify preference rankings in order to avoid answers which could have been less forthright if asked directly. Answers are in three ordinary categories (lower/less, similar, higher). We code these on a scale of 1 to 3 and classify mean responses between 1.5 and 2.5 as “same”, mean answers below 1,5 as “lower”, and mean replies above 2,5 as “higher”. In the aggregate, in Panel A we see that for the total sample and across clusters, the answers to both questions are in the “same” category. This suggests that on average participants think that their peers, institution and other investor categories rate ESG factors in a similar way.

To delve deeper into ESG preference beliefs, in Panel B we combine the answers to the two questions in a crosstab table. This reduces the sample slightly from 201 (Q3.21) and 196 (Q3.22) to 178 as we need respondents to have filled in both questions. The largest cell contains professionals who believe that peer institutions place similar importance on ESG compared to other investor categories and to their institution (44%). Examining the cells at the borders of the crosstab tables allows us to create a ranking of institutional ESG priorities relative to those of peer institution and other investor categories. For the total sample, 5% believe that their institution places lower importance on ESG factors compared to both peers and other investor categories.[59] This proportion is the highest among “sceptics” (9%), and decreases with support

[59] Q3.22 = 3 (higher) & Q3.21 = 1 or 2 (lower or same). Here we are relying on the transitive property of ordinary statement rankings. Thereby, if (1) peers place lower or similar importance on ESG than other investor categories and (2) peers also place higher importance on ESG than their institution, then the institution must place lower importance n ESG factors than peers and other investor categories. However, we cannot identify the institution versus investor categories ranking in cases where, for example, peers place higher or lower importance on ESG factors than both other categories.

for exclusions, falling to 4% in "devotees". In contrast, 18% consider their institutions to place higher importance on ESG factors than both peer institutions and other investor categories.[60] This increases with support for divestments, starting at 13% for "sceptics" and rising to 18% for "devotees".[61] Therefore, group support for negative screenings is positively associated with the perception that institutions place higher importance on ESG factors than other market participants. Furthermore, it is negatively associated with the belief their institution places a lower importance on ESG factors.

Finally, in Panel C, we calculate the self-described percentages of portfolios related to ESG factors and impact investing. The sample sizes are relatively small (153 and 134 respectively).[62] Based on the professionals who fill in an answer, about a third (32.6%) of portfolio assets are said to address ESG. In contrast, only 8% are said to be dedicated to impact investing. The proportional allocations to both do not seem to be affected either positively or negatively by support for exclusions.

4.4.3 Characteristics of Investment Portfolios

In the next table, **Table 13**, we display the investment portfolios characteristics of the respondents' institutions. Panel A focuses on the sizes of portfolios. The majority of portfolios are larger than $1mn, with only 3% being under that threshold. The rest are mostly evenly split among the other four categories ($1m - $99m, $100m - $999m, $1bn - $49bn, and >$50bn). Proportionally, "sceptics" tend to represent slightly larger portfolios than the rest of the sample. Most portfolios have low turnover as their holding periods are at least two years. 64% have a typical holding period of over five years and only 6% have a holding period below two years (Panel B).

In Panel C we show the allocation of portfolios across different dimensions. The first one is asset classes. On average over half of the institutional portfolios is allocated to equities (53%), and a third to fixed income. Real Estate and Alternatives make up 7 and 6% accordingly. Slightly over half of the portfolio is invested actively (56%), with 44% being passively invested. Similarly, just over half of the typical portfolio is managed in-house (53%) versus externally (47%). Portfolio asset allocations are similar by group. On average, "questioners" and "devotees" have a slightly higher active allocations than "sceptics". A higher proportion of "sceptics"' portfolios are managed in-house.

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[60] Q3.22 = 1 (lower) & Q3.21 = 2 or 3 (same or higher)

[61] The figure is 17% for "questioners"

[62] Not all respondents would have an investment portfolio they can refer to, be aware of portfolio asset allocations, or be willing to answer the question.

4.4.4 Summary of institutional characteristics

The majority of professionals are employed in institutions in the finance and/or investment industry. For the total and among clusters, the sample is biased towards European countries and the UK in particular. Members of our clusters are not concentrated in particular institutions, professions or countries. “Sceptics” are older and consequently have longer investment-related experiences than the main sample. Perceptions of institutional ESG priorities differ by cluster. The higher the cluster support for exclusions the higher the proportion of its members who believe that their institution places higher importance on ESG factors than other market participants, and vice versa. However, support for exclusions does not seem to be related to portfolio proportions addressing ESG issues or dedicated to impact investing.

5 Conclusion

In this paper we have shown the results of a survey of professionals on their sector exclusion opinions and how these are connected to sector performance expectations and climate change beliefs. We document that professionals express the highest levels of support for using negative screenings as a branding tool to attract funds from ethically concerned investors. In consist, they were least sympathetic towards using divestment as a risk management tool. We also show that professionals can be assigned to groups (“sceptics”, ”questioners”, and “devotees”) based on their exclusion beliefs.

Furthermore, respondents do not report an expectation that controversial sectors would outperform non-controversial sectors. However, they exhibit greater differences in opinion about the return characteristics of non-controversial stocks compared to controversial stocks. Since investor disagreement has been linked to higher returns this could provide one explanation for the higher observed controversial stock returns in the literature. In general, non-controversial stocks are expected to have a better risk return trade-off to environmentally controversial sectors This implies that expecting a higher return or lower risk from controversial stocks is not a driving force for divestment scepticism among industry professionals. Furthermore, divestment “devotees” are least likely to make use of recent historical data when forming expectations about future sector performances.

Finally, we record almost universal belief in global warming. However, emotional attachment to the subject increases with support for exclusions, making “emotional” appeals unlikely to convert “sceptics” to “devotees”.

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6 Figures

Figure 1 Question 1.1 Variation in mean scores and standard deviations.

This figure is a scatterplot of the means scores and standard of the responses in the professional sample to the statements in Q1.1 “Would you consider sector exclusion to be a useful tool for ...?”. 95% Confidence interval (bootstrap, n= 10,000) Legend: Addressing climate change issues: 1, Addressing industry regulation risks: 2, Addressing industry-wide setbacks: 3, Addressing investor reputational damage: 4, Addressing responsibility for climate change harms: 5, Addressing risks and holdings outside of portfolios: 6, Attracting funds from ethically concerned investors: 7, Conforming to moral beliefs: 8, Conforming to religious or cultural beliefs: 9, Putting pressure on companies to improve practices: 10

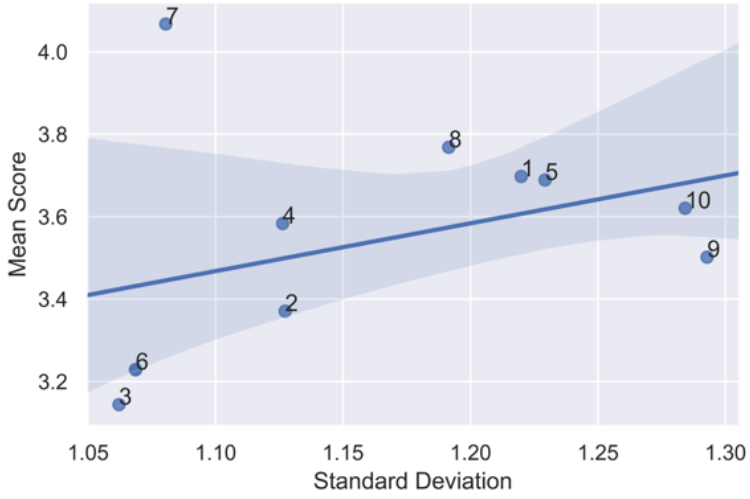
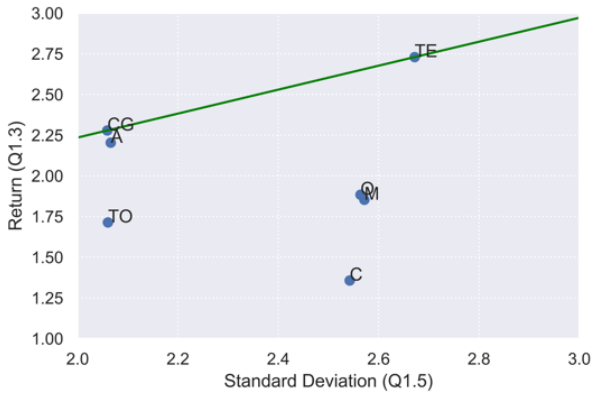


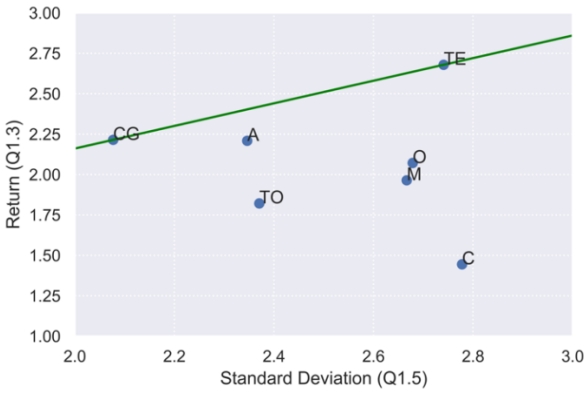
Figure 2 Q 1.3 & Q1.5 Estimated Return and Risk profiles of sectors

This Figure shows scatterplots of the mean estimates of respondents in the total sample (professionals) and the clusters of exclusion preferences for the expected return and risk of selected controversial and non-controversial sectors based on their answers to Q1.3 and Q1.5.
Legend: Alcohol: A, Coal: C, Consumer Goods: CG. Mining: M, Oil & Gas: O, Technology: TE, Tobacco: TO

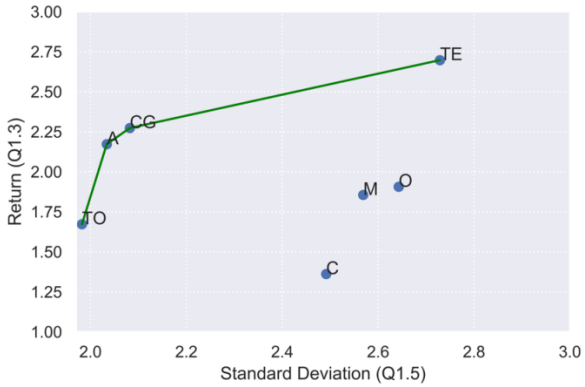
Panel A Overall Results



Panel B Sceptics



Panel C Questioners



Panel D Devotees

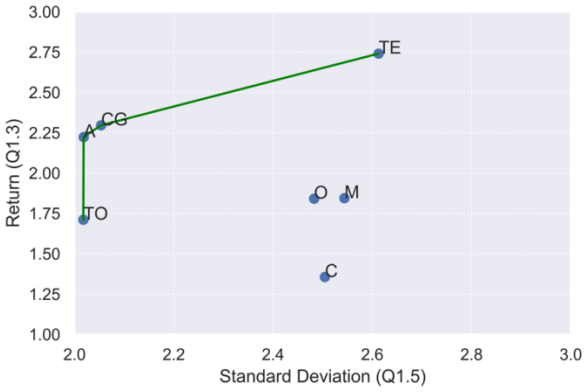
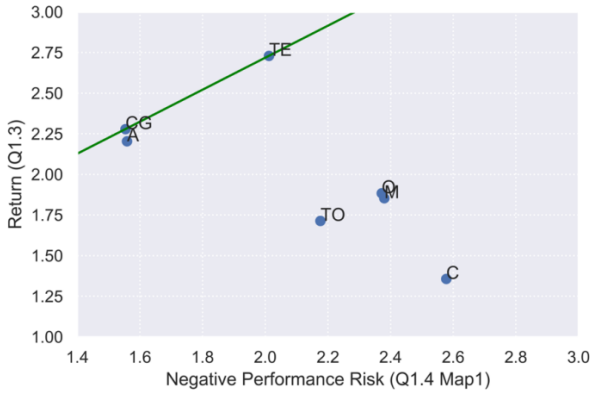


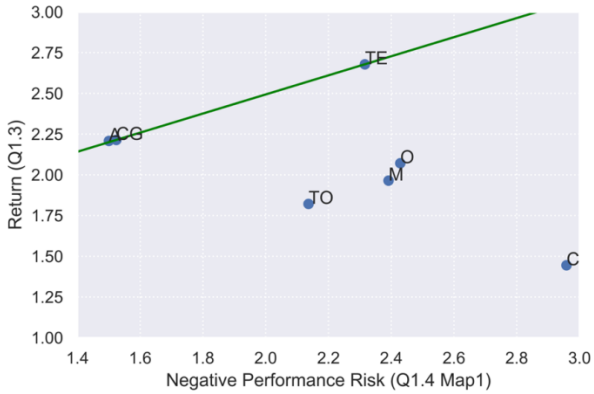
Figure 3 Estimated Negative Performance Risk and Return Profile for Q1.4

This Figure shows scatterplots of the mean estimates of respondents in the total sample (professionals) and the clusters of exclusion preferences for the expected return and negative performance risk of selected controversial and non-controversial sectors based on their answers to Q1.3 and Q1.4. (Using Map1)
Legend: Alcohol: A, Coal: C, Consumer Goods: CG. Mining: M, Oil & Gas: O, Technology: TE, Tobacco: TO

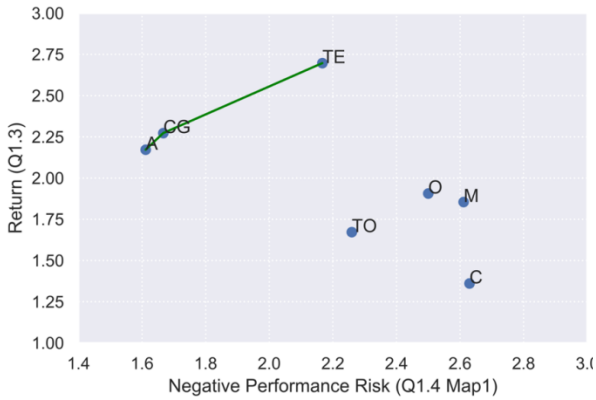
Panel A Overall Results



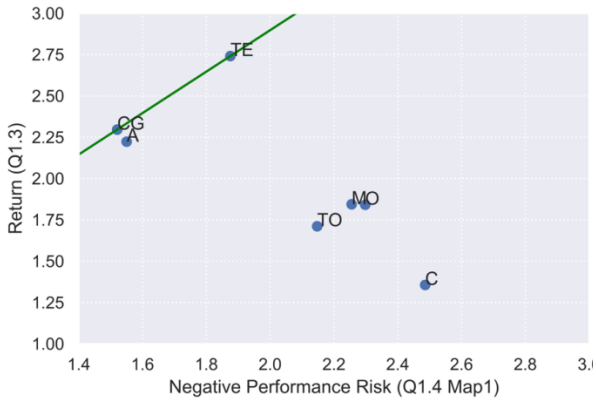
Panel B Sceptics



Panel C Questioners



Panel D Devotees



7 Tables

Table 1 Sample Selections

This table lists the events at which the survey was distributed, number of collected responses, and the primary audience at each event.

Event	# Responses	Primary audience type
Class at the Judge Business School, January 2019, UK	44	MBA and MFin (Master of Finance) students
ICGN Academic day and Conference, February 2019, Netherlands	23	Academics and industry professionals interested in corporate governance issues
Trends Investment Summit 2019, February 2019, Brussels	47	Asset owners and investment managers
Class at the Judge Business School, February 2019, UK	12	MPhil (Research masters) students
Science of Retirement Conference, February 2019, UK	86	Financial Planners and Advisers
Sparrows Capital Charities Trustees Event, March 2019, UK	22	Charity Trustees (2 duplicates discarded)
Invesco Sovereign Investment Programme, March 2019, UK	30	Sovereign Wealth Funds and Central Banks
Hong Kong Conferences, March 2019, UK	11	Senior asset managers
Emerging Markets Workshop, Norway, May 2019	15	Senior asset managers
Sustainability Seminar, CFA, Norway, May 2019	36	Responsible Investing professionals
Total	326	

Table 2 Question 1.1

This table describes the answers to Q1.1among multiple dimensions. Q1.1 is "Would you consider sector exclusion to be a useful tool for ..." Answers: Strongly disagree (1), Somewhat disagree (2), Neither agree or disagree (3), Somewhat agree (4), Strongly disagree (5).Panel A shows how each answer statement can be mapped to an underlying mechanism. Panel B displays the mean support, standard deviation of responses and number of responses for each statement among the professionals sample. The mean score is calculated by assigning a number of 1 (strongly disagree) to 5 (strongly agree) to each answer summing the scores and dividing them by the number of responses. Panel C provides further detail by breaking down the percentage allocation to each response category (of 1 (strongly disagree) to 5 (strongly agree)) for the statements, for the professional sample. Panel D displays the mean support, standard deviation of responses and number of responses for each statement among the students sample. Panel E shows the correlations among the responses for the professional sample.

Panel A Questions mapping to underlying mechanisms

Question	code	Underlying mechanism
Addressing climate change issues	Q1.1_1	Achieving a positive impact
Addressing industry regulation risks	Q1.1_2	Risk management
Addressing industry-wide setbacks	Q1.1_3	Risk management
Addressing investor reputational damage	Q1.1_4	Avoidance of criticism
Addressing responsibility for climate change harms	Q1.1_5	Avoidance of guilt/complicity
Addressing risks and holdings outside of portfolios	Q1.1_6	Broader risk management
Attracting funds from ethically concerned investors	Q1.1_7	Branding tool
Conforming to moral beliefs	Q1.1_8	Expression of beliefs
Conforming to religious or cultural beliefs	Q1.1_9	Expression of beliefs
Putting pressure on companies to improve practices	Q1.1_10	Achieving a positive impact

Panel B: Responses of Professionals, N = 263

Question	code	mean	std	n
Attracting funds from ethically concerned investors	Q1.1_7	4.07	1.08	251
Conforming to moral beliefs	Q1.1_8	3.77	1.19	246
Addressing climate change issues	Q1.1_1	3.70	1.22	258
Addressing responsibility for climate change harms	Q1.1_5	3.69	1.23	251
Putting pressure on companies to improve practices	Q1.1_10	3.62	1.28	253
Addressing investor reputational damage	Q1.1_4	3.58	1.13	245
Conforming to religious or cultural beliefs	Q1.1_9	3.50	1.29	239
Addressing industry regulation risks	Q1.1_2	3.37	1.13	248
Addressing risks and holdings outside of portfolios	Q1.1_6	3.23	1.07	227
Addressing industry-wide setbacks	Q1.1_3	3.14	1.06	236

Panel C Proportional Allocations to each score (in %), Professionals

Statement	Code\Score	1	2	3	4	5
Addressing climate change issues	Q1.1_1	7	14	11	39	29
Addressing industry regulation risks	Q1.1_2	7	16	25	37	15
Addressing industry-wide setbacks	Q1.1_3	7	20	34	30	9
Addressing investor reputational damage	Q1.1_4	6	13	20	40	21
Addressing responsibility for climate change harms	Q1.1_5	7	14	11	39	29
Addressing risks and holdings outside of portfolios	Q1.1_6	6	17	37	28	12
Attracting funds from ethically concerned investors	Q1.1_7	5	5	12	36	43
Conforming to moral beliefs	Q1.1_8	7	9	15	37	31
Conforming to religious or cultural beliefs	Q1.1_9	10	13	23	27	28
Putting pressure on companies to improve practices	Q1.1_10	10	12	11	39	28

Panel D Students, N = 63.

Statement	code	mean	std	n
Addressing industry regulation risks	Q1.1_2	3.48	1.08	62
Putting pressure on companies to improve practices	Q1.1_10	3.44	1.24	63
Addressing risks and holdings outside of portfolios	Q1.1_6	3.35	1.02	63
Conforming to moral beliefs	Q1.1_8	3.32	1.24	63
Addressing industry-wide setbacks	Q1.1_3	3.29	1.05	62
Addressing climate change issues	Q1.1_1	3.19	1.38	63

Panel E Correlation among the responses, Pearson correlations, Professionals										
	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_	Q1.1_1
Q1.1_1	1.00	0.86	0.62	0.95	1.00	0.59	0.93	0.98	0.90	0.99
Q1.1_2	0.86	1.00	0.92	0.97	0.85	0.89	0.69	0.85	0.87	0.86
Q1.1_3	0.62	0.92	1.00	0.81	0.61	0.98	0.43	0.65	0.77	0.64
Q1.1_4	0.95	0.97	0.81	1.00	0.94	0.79	0.83	0.95	0.91	0.94
Q1.1_5	1.00	0.85	0.61	0.94	1.00	0.58	0.93	0.98	0.89	0.99
Q1.1_6	0.59	0.89	0.98	0.79	0.58	1.00	0.46	0.65	0.80	0.61
Q1.1_7	0.93	0.69	0.43	0.83	0.93	0.46	1.00	0.97	0.89	0.92
Q1.1_8	0.98	0.85	0.65	0.95	0.98	0.65	0.97	1.00	0.94	0.98
Q1.1_9	0.90	0.87	0.77	0.91	0.89	0.80	0.89	0.94	1.00	0.90
Q1.1_1	0.99	0.86	0.64	0.94	0.99	0.61	0.92	0.98	0.90	1.00

Table 3 Q1.1 Cluster Centroids of Sector Exclusion Preferences

This table shows how respondents in the professional (Panel A) and student (Panel B) samples have been assigned to clusters based on their exclusion preferences. Each cell contains the centroid value for a given statement across each cluster, and can vary from 1 to 5 in accordance with the range of values in the statement responses (1 (strongly disagree) to 5 (strongly agree)). The last column shows the number of respondents in each cluster. Respondents are assigned the cluster which is the closest match to their exclusion preferences. The cluster formation and assignment procedure is a k-means clustering algorithm described in the Internet Appendix.

Panel A: Professionals Sample

Statement\Cluster	1	2	3	4	5	6	7	8	9	10	#
Sceptics	1.91	2.11	2.24	2.24	1.79	2.13	2.33	1.76	1.76	1.89	34
Questioners	3.07	2.86	2.71	3.39	3.15	3.07	4.12	4.02	3.95	3.07	72
Devotees	4.43	3.94	3.66	4.01	4.4	3.65	4.39	4.08	3.69	4.27	145

Panel B: Students Sample

Statement\Cluster	1	2	3	6	8	10	#
Sceptics	1.56	2.11	1.78	2.22	1.56	1.78	9
Questioners	1.69	3.63	3.63	3.81	3.19	3.38	16
Devotees	4.43	3.94	3.66	4.01	4.4	3.65	38

Table 4 Return views of professionals (Q1.3)

This table shows the mean estimates, standard deviation of estimates, and number of respondents for the total sample (professionals) and the clusters of exclusion preferences for Q1.3 which queries their beliefs about selected controversial and non-controversial sector returns.
Q1.3 "How would you expect the stock market returns from each of these sectors to compare to overall market returns over a 10-year period?" Answer statements: At least 1% a year < market: 1; About the same: 2; At least 1% a year > market: 3
Classification: mean score < 1.5 is "lower", between 1.5 and 2.5 is "same" and >2.5 is "higher"

Panel	Sector	code	mean	std	n
Panel A: Overall results	Alcohol	Q1.3_A	same	0.72	216
	Coal	Q1.3_C	lower	0.65	213
	Consumer Goods	Q1.3_CG	same	0.56	226
	Mining	Q1.3_M	same	0.75	218
	Oil & Gas	Q1.3_O	same	0.77	224
	Technology	Q1.3_TE	higher	0.56	233
	Tobacco	Q1.3_TO	same	0.76	220
Panel B Sceptics	Alcohol	Q1.3_A	same	0.83	24
	Coal	Q1.3_C	lower	0.75	27
	Consumer Goods	Q1.3_CG	same	0.63	28
	Mining	Q1.3_M	same	0.79	28
	Oil & Gas	Q1.3_O	same	0.86	28
	Technology	Q1.3_TE	higher	0.67	28
	Tobacco	Q1.3_TO	same	0.86	28
Panel C: Questioners	Alcohol	Q1.3_A	same	0.70	64
	Coal	Q1.3_C	lower	0.63	61
	Consumer Goods	Q1.3_CG	same	0.51	66
	Mining	Q1.3_M	same	0.72	62
	Oil & Gas	Q1.3_O	same	0.75	64
	Technology	Q1.3_TE	higher	0.55	66
	Tobacco	Q1.3_TO	same	0.71	64
Panel D: Devotees	Alcohol	Q1.3_A	same	0.71	121
	Coal	Q1.3_C	lower	0.66	118
	Consumer Goods	Q1.3_CG	same	0.58	125
	Mining	Q1.3_M	same	0.76	122
	Oil & Gas	Q1.3_O	same	0.76	126
	Technology	Q1.3_TE	higher	0.56	131
	Tobacco	Q1.3_TO	same	0.76	121

Table 5 Variation of returns views by professionals (Q1.5)

This table shows the mean estimates, standard deviation of estimates, and number of respondents for the total sample (professionals) and the clusters of exclusion preferences for Q1.5 which queries their beliefs about selected controversial and non-controversial sector variation (via standard deviation).Q1.5 "How would you expect the volatility of each of these sectors (annualised standard deviation) to compare to market volatility over a 10-year period?" Answer statements: At least 1% < market: 1; About the same: 2; At least 1% > market: 3
Classification: mean score < 1.5 is "lower", between 1.5 and 2.5 is "same" and >2.5 is "higher"

Panel	Sector	code	mean	std	n
Panel A: Overall results	Alcohol	Q1.5_A	same	0.69	197
	Coal	Q1.5_C	higher	0.73	201
	Consumer Goods	Q1.5_CG	same	0.63	203
	Mining	Q1.5_M	higher	0.63	203
	Oil & Gas	Q1.5_O	higher	0.65	204
	Technology	Q1.5_TE	higher	0.57	201
	Tobacco	Q1.5_TO	same	0.80	199
Panel B: Sceptics	Alcohol	Q1.5_A	same	0.75	26
	Coal	Q1.5_C	higher	0.51	27
	Consumer Goods	Q1.5_CG	same	0.69	26
	Mining	Q1.5_M	higher	0.48	27
	Oil & Gas	Q1.5_O	higher	0.48	28
	Technology	Q1.5_TE	higher	0.53	27
	Tobacco	Q1.5_TO	same	0.79	27
Panel C: Questioners	Alcohol	Q1.5_A	same	0.74	59
	Coal	Q1.5_C	same	0.77	59
	Consumer Goods	Q1.5_CG	same	0.61	61
	Mining	Q1.5_M	higher	0.68	58
	Oil & Gas	Q1.5_O	higher	0.62	56
	Technology	Q1.5_TE	higher	0.49	59
	Tobacco	Q1.5_TO	same	0.80	56
Panel D: Devotees	Alcohol	Q1.5_A	same	0.65	109
	Coal	Q1.5_C	same	0.75	111
	Consumer Goods	Q1.5_CG	same	0.63	112
	Mining	Q1.5_M	higher	0.64	114
	Oil & Gas	Q1.5_O	same	0.70	116
	Technology	Q1.5_TE	higher	0.62	111
	Tobacco	Q1.5_TO	same	0.79	113

Table 6 Negative performance risk estimates of responders (Q1.4)

This table shows the mean estimates, standard deviation of estimates, and number of respondents for the total sample (professionals) and the clusters of exclusion preferences for Q1.4 which queries their beliefs about selected controversial and non-controversial sector negative performance risk. The different mapping techniques are shown in Panel A. Panel B displays the results using the first mapping method (Map1), as the two mapping methods result in the same sector rankings. Q1.4 "Over each of 2020, 2021, ….2029, what is the worst 1-year under-performance relative to the market that you expect to observe for each sector?" (maximum absolute difference between market and sector returns, when the sector return is lower than the market return)
Classification: "base" is Map 1 between 1.5 and 2.5, "low" if below, "high" between 2.5 and 3.5, "very high" if above.

Panel A: Mapping	answer	Map1 (Categorical)	Map2 (Mid-point-based)
	0-9%	1	4.5
	10-29%	2	19.5
	30-49%	3	39.5
	50-69%	4	59.5
	>70%	5	79.5

	Sector	code	Mean_1	Std_1	n
Panel B: Overall Results	Alcohol	Q1.4_A	base	0.85	179
(same ranking by mapping method)	Coal	Q1.4_C	high	1.12	187
	Consumer Goods	Q1.4_CG	base	0.82	177
	Mining	Q1.4_M	base	1.10	179
	Oil & Gas	Q1.4_O	base	1.08	183
	Technology	Q1.4_TE	base	1.22	173
	Tobacco	Q1.4_TO	base	1.16	182
Panel C: Sceptics	Alcohol	Q1.4_A	base	1.01	22
	Coal	Q1.4_C	high	1.49	24
	Consumer Goods	Q1.4_CG	base	0.98	21
	Mining	Q1.4_M	base	1.27	23
	Oil & Gas	Q1.4_O	base	1.25	21
	Technology	Q1.4_TE	base	1.49	19
	Tobacco	Q1.4_TO	base	1.46	22
Panel D: Questioners	Alcohol	Q1.4_A	base	0.96	54
	Coal	Q1.4_C	high	1.07	54
	Consumer Goods	Q1.4_CG	base	0.80	54
	Mining	Q1.4_M	high	1.14	54
	Oil & Gas	Q1.4_O	base	1.15	54
	Technology	Q1.4_TE	base	1.16	54
	Tobacco	Q1.4_TO	base	1.10	54
Panel E: Devotees	Alcohol	Q1.4_A	base	0.76	100
	Coal	Q1.4_C	base	1.05	105
	Consumer Goods	Q1.4_CG	base	0.82	98
	Mining	Q1.4_M	base	1.05	98
	Oil & Gas	Q1.4_O	base	1.03	104
	Technology	Q1.4_TE	base	1.19	96
	Tobacco	Q1.4_TO	base	1.13	102

Table 7 Real returns data for comparison

In this table we show the mapping for the World, USA, European and UK sectors to our sector risk and return questions. We use the past 10 year returns (2009-2018) for each market in their currency. World and USA markets are shown in USD currency. Europe is in EUR and the UK is in GBP. The source for the World, European and US markets and sector data is FTSE Russell (2019) and (for Coal sector) Thomson Reuters (2019) data. We use Ken French (2019) database for the US market and sectors. The specific series used are listed in the Internet Appendix.

Panel A: Real return mapping to Q1.3(return) using data from 2009 to 2018

metric	Annualised 10-year returns in %				Corresponding Category			
Sector\market	World	EUR	US	UK	World	EUR	US	UK
Alcohol	12	16	13	15	higher	higher	same	higher
Coal	5	2	-12		lower	lower	lower	
Consumer goods	11	14	9	11	same	higher	lower	higher
Mining	2	10	5	7	lower	same	lower	same
Oil & Gas	3	7	3	5	lower	lower	lower	lower
Technology	17	12	18	20	higher	higher	higher	higher
Tobacco	11	9	14	6	same	same	same	lower
Market	10	9	13	8	same	same	same	same

Panel B: Real return mapping to Q1.5(standard deviation) using data from 2009 to 2018

metric	Return 10y standard deviations				Corresponding Category			
Sector\market	World	EUR	US	UK	World	EUR	US	UK
Alcohol	14	20	11	21	same	higher	lower	higher
Coal	48	129	67		higher	higher	higher	
Consumer goods	14	15	9	19	same	higher	lower	same
Mining	42	52	42	56	higher	higher	higher	higher
Oil & Gas	17	14	17	20	higher	same	higher	higher
Technology	20	13	19	34	higher	same	higher	higher
Tobacco	18	21	18	21	higher	higher	higher	higher
Market	14	13	13	19	same	same	same	same

Panel C: Real return mapping to Q1.4 (negative performance risk) using data from 2009 to 2018

metric	Maximum 10y under-performance				Corresponding Category			
Sector\market	World	EUR	US	UK	World	EUR	US	UK
Alcohol	9	9	8	7	low	low	low	low
Coal	48	71	81		high	very high	very high	
Consumer goods	6	3	15	5	low	low	base	low
Mining	48	49	37	44	high	high	high	high
Oil & Gas	20	19	24	21	base	base	base	base
Technology	2	13	3	0	low	base	low	low
Tobacco	25	30	25	17	base	base	base	base

Table 8 Respondent Climate Change views: Global Warming

This table presents the proportional allocation of respondent answers to questions related to global warming. Panel A shows answers for Q2.1 and Q2.2 and Panel B displays responses to Q2.4. The results are shown for the total professionals sample and the three clusters of exclusion opinions. The wording of the questions is:
Q2.1 Do you think that global warming is happening? – Answer statements: Yes, No
Q2.2 Assuming global warming is happening, do you think it is caused mostly by… ?
Answer statements: Human activities; Natural changes in the environment; Other (please specify):
Q2.4 When do you think global warming will start to harm people?
Answer statements: It is happening now, In <10 years, In 10-24 years, In 25-50 years , In > 50 years

Panel	Cluster	Code	Total	Sceptics	Questioners	Devotees
Panel A: Global Warming views: Responses for Q2.1 and Q2.2 (in %)	Q2.1	%Yes	98	94	99	99
	Q2.1	%No	2	6	1	1
	Q2.1	n	247	33	67	136
	Q2.2	%Human	87	79	87	88
	Q2.2	%Environment	7	21	3	7
	Q2.2	%Both	6	0	10	6
	Q2.2	n	250	34	68	138
Panel B: Estimates for the timeline of Global Warming Impact (Q2.4)	% It is happening now	Q2.4 %Now	57	77	61	51
	% In <10 years	Q2.4 %l10	17	6	12	21
	% In 10-24 years	Q2.4 %10-24	15	3	18	16
	% In 25-50 years	Q2.4 %25-50	6	6	7	6
	% In > 50 years	Q2.4 %m50	4	6	1	5
	Q2.4 n	Q2.4 n	249	31	67	141

Table 9 Respondent Climate Change views: Global Warming concerns (Q2.3) and other feelings (Q2.8)

This table shows the mean estimates, standard deviation of estimates, and number of respondents for the total sample (professionals) and the clusters of exclusion preferences for Q2.3 and Q2.8, which queries their level of emotional attachment towards global warming among selected emotions. . The wording of the questions is:
Q2.3 How concerned are you about global warming? Answer statements: 1: Not at all concerned, 2: Not very concerned, 3: Somewhat concerned, 4: Very concerned
Q2.8 How strongly do you feel each of these emotions when you think about the issue of global warming? Answer statements: 1: Not at all, 2: Not very, 3: Moderately, 4: Very; Feelings listed: Afraid, Angry, Helpless, Hopeful, Outraged
Classification: "base" if between 2 and 3, "high" is between 3 to 3.5", "very high" if above, "low" if below 2.

Panel	Item	code	mean	std	n
Panel A: Overall results	Concern	Q2.3	high	0.66	260
	Afraid	Q2.8_AF	base	0.80	261
	Angry	Q2.8_AN	base	0.93	260
	Helpless	Q2.8_HEL	base	0.89	256
	Hopeful	Q2.8_HOP	base	0.84	259
	Outraged	Q2.8_O	base	0.96	249
Panel B Sceptics	Concern	Q2.3	high	0.97	34
	Afraid	Q2.8_AF	base	0.96	34
	Angry	Q2.8_AN	base	1.16	34
	Helpless	Q2.8_HEL	base	1.06	33
	Hopeful	Q2.8_HOP	base	1.02	34
	Outraged	Q2.8_O	base	1.11	33
Panel C Questioners	Concern	Q2.3	high	0.65	72
	Afraid	Q2.8_AF	base	0.73	72
	Angry	Q2.8_AN	base	0.93	72
	Helpless	Q2.8_HEL	high	0.88	71
	Hopeful	Q2.8_HOP	base	0.80	72
	Outraged	Q2.8_O	base	0.93	69
Panel D: Devotees	Concern	Q2.3	very high	0.58	143
	Afraid	Q2.8_AF	base	0.78	144
	Angry	Q2.8_AN	base	0.86	143
	Helpless	Q2.8_HEL	base	0.85	141
	Hopeful	Q2.8_HOP	base	0.83	142
	Outraged	Q2.8_O	base	0.96	137

Table 10 Top of mind on Global Warming (Q2,5, Q2.6 and Q2.7)

This table presents the proportional allocation of respondent answers to questions related to how top of mind global warming is for them (Q2.5-Q2.7). The results are shown for the total professionals sample (Panel A)and the three clusters of exclusion opinion (Panels B-D). The wording of the questions is:
Q2.5 How often do you discuss global warming with your **friends and family**?
Q2.6 How often do you discuss global warming with your **work colleagues**?
Q2.7 How often do you hear about global warming in the media (TV, radio, newspapers/news internet, etc.?)
Answer statements: 1: Once a year or less often, 2: Several times a year, 3: At least once a month, 4: At least once a week.

	Answer Option	code	Q2.5	Q2.6	Q2.7
Panel A: Total results	% Once a year or less often	% 1	18	24	0
	% Several times a year	% 2	36	31	16
	% At least once a month	% 3	25	25	27
	% At least once a week	% 4	21	21	56
	n	n	258	257	261
Panel B: Sceptics	% Once a year or less often	% 1	18	27	3
	% Several times a year	% 2	33	30	9
	% At least once a month	% 3	27	12	29
	% At least once a week	% 4	21	30	59
	n	n	33.	33	34
Panel C: Questioners	% Once a year or less often	% 1	18	23	0
	% Several times a year	% 2	37	27	18
	% At least once a month	% 3	25	29	21
	% At least once a week	% 4	20	21	61
	n	n	71	70	72
Panel D: Devotees	% Once a year or less often	% 1	17	22	0
	% Several times a year	% 2	36	32	17
	% At least once a month	% 3	26	26	28
	% At least once a week	% 4	21	20	55
	n	n	143	143	144

Table 11 Sample Characteristics

This table shows answers to questions related to the sample characteristics for the total sample (professional) and the three clusters of exclusion preferences. Panels A to D present the proportional allocation of respondent self-declared employment institution (Panel A, Q3.1), occupation (Panel B,Q3.11), institutional location(Panel C, Q3.10), and age group (Panel D, Q3.13). Panel E displays the .mean years of investment experience of the professionals, as well as its standard deviation and sample size. In Panels A to C we only display categories where there are at least five respondents who fall into the given category. Furthermore, the sample row at the bottom of Panels A to C shows the total sample and total members of each cluster, not the number of respondents to each question.

Panel	Cluster	Total	% Total	% Sceptics	% Questioners	% Devotees
Panel A: Sample institutions (Q3.1 How is the institution at which you are employed best described?)	Financial Planning/Advisory	38	14.4	14.7	13.9	12.4
	Mutual Fund Company	33	12.5	11.8	18.1	11.0
	Consultancy	28	10.6	11.8	8.3	10.3
	Family office	26	9.9	5.9	12.5	10.3
	Bank	22	8.4	8.8	5.6	10.3
	Other	16	6.1	2.9	5.6	7.6
	Sovereign wealth fund	15	5.7	2.9	6.9	6.2
	Public pension fund	11	4.2	2.9	4.2	4.8
	Individual investor	9	3.4	2.9	2.8	2.8
	Endowment, charity	9	3.4	2.9	1.4	4.8
	Private pension fund	9	3.4	2.9	4.2	3.4
	Wealth Management	7	2.7	2.9	4.2	2.1
	Academic	6	2.3	2.9	1.4	2.8
	Insurance company	6	2.3	2.9	0.0	3.4
	% Sample in above categories	89	89.4	79.4	88.9	92.4
Panel B: Sample Occupations (Q3.11 What is your primary position?)	Other	58	22.1	23.5	19.4	24.1
	Financial Planner/Adviser	44	16.7	8.8	16.7	17.9
	Analyst/Strategist	35	13.3	8.8	13.9	14.5
	CFO/COO/Chair	28	10.6	8.8	11.1	11.0
	Fund Manager	18	6.8	2.9	8.3	6.9
	CEO	11	4.2	0.0	5.6	4.8
	Academic	10	3.8	2.9	2.8	4.1
	ESG Specialist	10	3.8	5.9	6.9	2.1
	CEO; CFO/COO/Chair	10	3.8	8.8	0.0	4.8
	CIO	8	3.0	8.8	5.6	0.7
	MD	7	2.7	2.9	0.0	3.4
	% Sample in above categories	91	90.9	82.4	90.3	94.5
Panel C: Sample Institutional Location (Q3.10 In which country is your institution's headquarters based?)	UK	99	37.6	41.2	33.3	37.9
	Norway	40	15.2	11.8	20.8	13.8
	Belgium	21	8.0	2.9	8.3	9.0
	USA	14	5.3	5.9	4.2	6.2
	Ireland	7	2.7	0.0	2.8	3.4
	France	6	2.3	5.9	1.4	1.4
	Netherlands	6	2.3	0.0	4.2	2.1
	% Sample in above categories	73	73.4	67.6	75.0	73.8
	# Sample	263	263	34	72	145
Panel D: Sample Age Group (Q3.13 What is your age group?)	< 25 years		1	0	0	1
	25-44 years		47	32	55	45
	45-65 years		50	62	42	51
	> 65 years		3	6	3	2
	n		253	34	71	138

Panel E: Sample Investment Experience (Q3.12 How many years of investment-related experience do you have?)	Cluster/metrics	mean	std	n
	Total	18	10	212
	Sceptics	21	10	31
	Questioners	17	9	60
	Devotees	18	10	112

Table 12 Sample ESG Beliefs and Characteristics

This table shows answers to questions related to ESG beliefs of the respondents and the characteristics of the investments portfolios at the institutions where they are employed, for the total sample (professional) and the three clusters of exclusion preferences. Panels A and C display the mean estimates, standard deviation of estimates, and number of respondents for each question, while Panel C presents how the answers are proportionally allocation among two questions, using a crosstab. The specific questions and answer statement are described in each panel.

Panel A Perceived importance of ESG for peers and institution
Q3.21 What importance do your peer institutions (category selected above) place on Environmental, Social and Governance (ESG) factors **compared to other investor categories**? 1: Less than other investors, 2: Similar, Higher than other investors
Q3.22 What importance do your peer institutions place on ESG factors compared to your institution? Answer statements: 1: Less than my institution, 2: Similar, 3: Higher than my institution
Classification: "same" between 1.5 and 2.5. "lower" if below", "higher" if above

Question	Q3.21			Q3.22		
Cluster	Mean	Std	N	Mean	Std	N
Total	same	0.65	201	same	0.60	196
Sceptics	same	0.69	26	same	0.62	27
Questioners	same	0.58	58	same	0.53	57
Devotees	same	0.69	111	same	0.63	107

Panel B Crosstabs of respondent answers to Q3.21 (rows) and Q3.22 (columns).
In percentages, Numbers sum up to 100. Questions and their answer statements are described in Panel A

	Q3.21 / Q3.22	lower	same	higher
Total Sample	lower	2	7	1
N=178	same	7	44	4
	higher	11	15	9
Sceptics	lower	0	9	4
N=23	same	4	39	4
	lower	9	26	4
Questioners	lower	0	4	2
N = 52	same	8	52	4
	lower	10	17	4
Devotees,	lower	4	9	0
N=98	same	6	41	4
	lower	12	11	12

Panel C Portfolio allocations to ESG and Impact Investing. (in %)
Q3.3 How much of your portfolio addresses ESG issues?

Q3.4 How much of your portfolio is dedicated to impact investing?

	Q3.3			Q3.4		
Cluster	Mean	Std	N	Mean	Std	N
Total	32.6	38.8	153	8.0	19.1	134
Sceptics	35.1	43.0	22	8.4	23.4	19
Questioners	39.8	41.1	43	7.7	16.8	40
Devotees	28.5	36.2	81	8.4	20.0	69

Table 13 Characteristics of Investment Portfolios

This table presents the proportional allocation of respondent answers to questions related to the characteristics of the investment portfolio of the institutions t which they are employed (Q3.5-Q3.9). The results are shown for the total professionals sample and the three clusters of exclusion opinion. The wording of the questions is:
Panel A Q3.5 What is the total size of assets under management or advice for your institution?
Panel B Q3.6 What is the typical holding period for investments in the portfolios that you manage or advise?
Panel C
C1: Q3.7 What percentage of your portfolio is invested in each of the following asset classes?
C2: Q3.8 What percentage of your portfolio is invested actively versus passively?
C3: Q3.9 What percentage of your assets are managed in-house vs outsourced?

Panel	Size / Cluster	Code/Cluster	Total	Sceptics	Questioners	Devotees
A: Total	% < $1m	1	3	0	3	3
Assets	% $1m - $99m	2	23	12	21	24
Under	% $100m - $999m	3	25	33	25	24
Management	% $1bn - $49bn	4	26	29	25	27
	% >$50bn	5	23	25	26	22
	n	n	219	24	68	119
B: Typical	% Short (< 6 months)	1	1	0	3	0
holding	% Medium (6 - 23 months)	2	5	14	6	3
period	% Long (2 - 5 years)	3	29	18	26	36
	% Very long (> 5 years)	4	64	68	64	61
	n	n	221	28	66	118
C1: Portfolio	Fixed income	Q3.7_F_C	33	37	31	34
allocation	Equities	Q3.7_E_C	53	53	55	53
	Alternatives	Q3.7_A_C	7	4	7	7
	Real Estate	Q3.7_R_C	6	6	6	6
	Sample	Q3.7 n	181	23	53	98
C2: Active-	Active	Q3.8_A_C	56	51	59	57
Passive	Passive	Q3.8_P_C	44	49	41	43
	Sample	Q3.8 n	198	26	61	103
C3: In-house/	Managed in-house	Q3.9_I_C	53	63	53	50
outsourced	Externally managed	Q3.9_E_C	47	37	47	50
	Sample	Q3.9 n	194	24	60	104

Appendix

Sector Exclusion survey

Welcome to our survey. We are researchers from Judge Business School, the University of Cambridge:

Vaska Atta-Darkua, PhD Candidate

Professor Elroy Dimson

We are interested in understanding perceptions of sector exclusions from portfolios. You will also be asked to answer some questions about the prospects for equity sectors. This questionnaire aims to solicit no information that can be used to identify you. All responses will be kept completely confidential.

It should take you around **10-15 minutes** to complete.

Consent form

Please read this form carefully. If you are happy to participate in this study, **tick** the consent box below.

- √ I have read the participant information, and consent to participate in this research study about sector exclusion.
- √ I have had the opportunity to ask the researcher any questions that I have about the study and my involvement in it. I am aware that I can contact the researcher Vaska Atta-Darkua v.darkua@jbs.cam.ac.uk at any time or in the next instance I can also contact her supervisor Elroy Dimson e.dimson@jbs.cam.ac.uk.
- √ I agree that data may be shared with other researchers at the University of Cambridge for future research. I understand that all efforts will be made to ensure I cannot be identified (except as may be required by law).
- √ I understand that I am free to withdraw at any time without giving a reason.

☐ I consent

☐ I do not consent, I do not wish to participate

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1 Exclusion Views

This section will ask a range of questions about your opinions on sector exclusion. The practice of excluding sectors consists of selling out of and no longer purchasing shares of stocks in certain sectors, which the investor has decided not to hold.

Q1.1 Would you consider sector exclusion to be a useful tool for ...? (tick accordingly)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat Agree	Strongly agree	Don't know
Addressing climate change issues						
Addressing industry regulation risks						
Addressing industry-wide setbacks						
Addressing investor reputational damage						
Addressing responsibility for climate change harms						
Addressing risks and holdings outside of portfolios						
Attracting funds from ethically concerned investors						
Conforming to moral beliefs						
Conforming to religious or cultural beliefs						
Putting pressure on companies to improve practices						

Q1.2 Are there other situations where you would consider sector exclusion to be a useful tool which were not mentioned above? If so, please describe them below.

Q1.3 How would you expect the stock market returns from each of these sectors to compare to overall market returns over a 10-year period?

	At least 1% a year < market	About the same	At least 1% a year > market	Don't know
Alcohol				
Coal				
Consumer Goods				
Mining				
Oil & Gas				
Technology				
Tobacco				

Q1.4 Over each of 2020, 2021, ….2029, what is the worst 1-year under-performance relative to the market that you expect to observe for each sector? (maximum absolute difference between market and sector returns, when the sector return is lower than the market return)

	0-9%	10-29%	30-49%	50-69%	> 70%	Don't know
Alcohol						
Coal						
Consumer Goods						
Mining						
Oil & Gas						
Technology						
Tobacco						

Q1.5 How would you expect the volatility (annualised standard deviation) of each of these sectors to compare to market volatility over a 10-year period?

	At least 1% < market	About the same	At least 1% > market	Don't know (DK)
Alcohol				
Coal				
Consumer Goods				
Mining				
Oil & Gas				
Technology				
Tobacco				

2 Climate Change views

In this section we will ask questions about your climate change views and the visibility of climate change issues. *Global warming* refers to the idea that the world's average temperature has been increasing over the past century, may be increasing more in the future, and that the world's climate may change as a result.

Q2.1 Do you think that global warming is happening? **(**tick accordingly)

Yes	No	Don't know (DK)

Q2.2 Assuming global warming is happening, do you think it is caused mostly by… ?

Human activities	Natural changes in the environment	Other (please specify):	DK

Q2.3 How concerned are you about global warming?

Not at all concerned	Not very concerned	Somewhat concerned	Very concerned	DK

Q2.4 When do you think global warming will start to harm people?

It is happening now	In <10 years	In 10-24 years	In 25-50 years	In > 50 years	DK	NA

Q2.5 How often do you discuss global warming with your **friends and family**?

Once a year or less often	Several times a year	At least once a month	At least once a week	DK

Q2.6 How often do you discuss global warming with your **work colleagues**?

Once a year or less often	Several times a year	At least once a month	At least once a week	DK

Q2.7 How often do you hear about global warming in the media(TV, radio, newspapers/news internet, etc.?)

Once a year or less often	Several times a year	At least once a month	At least once a week	DK

Q2.8 How strongly do you feel each of these emotions when you think about the issue of global warming?

	Not at all	Not very	Moderately	Very	Don't know
Afraid					
Angry					
Helpless					
Hopeful					
Outraged					

3 Investment Profile

This section is going to ask questions about your institution to help us classify the responses into categories.

Q3.1 How is the institution at which you are employed best described? (tick accordingly)

Public pension fund	Private equity	Consultancy
Private pension fund	Mutual fund company	Family office
Insurance company	Endowment, charity	Academic
Hedge fund	Sovereign wealth fund	Individual investor
Regulatory body	Bank	Other (please specify):

Q3.21 What importance do your peer institutions (category selected above) place on Environmental, Social and Governance (ESG) factors **compared to other investor categories**?

Less than other investors	Similar	Higher than other investors	Don't know (DK)

Q3.22 What importance do your peer institutions place on ESG factors **compared to your institution**?

Less than my institution	Similar	Higher than my institution	Don't know (DK)

Q3.3 How much of your portfolio addresses ESG issues? _____% If NA, please leave empty.

Q3.4 How much of your portfolio is dedicated to impact investing? _____% If NA, please leave empty.

Q3.5 What is the total size of assets under management or advice for your institution?

< $1m	$1m - $99m	$100m - $999m	$1bn - $49bn	> $50bn	DK	NA

Q3.6 What is the typical holding period for investments in the portfolios that you manage or advise?

Short (< 6 months)	Medium (6 - 23 months)	Long (2 - 5 years)	Very long (> 5 years)	DK	NA

Q3.7 What percentage of your portfolio is invested in each of the following asset classes? If NA, please leave empty.

____% in fixed income	____% in equities	____% in alternatives	____% in real estate

Q3.8 What percentage of your portfolio is invested actively versus passively? If NA, please leave empty.

____% in active investments	____% in passive investments

Q3.9 What percentage of your assets are managed in-house vs outsourced? If NA, please leave empty.

____% managed in-house	____% outsourced to external managers

Q3.10 In which country is your institution's headquarters based? _____

Q3.11 What is your primary position?

CEO	MD	CIO	Fund Manager	Analyst/Strategist
CFO/COO/Chair	Academic	Student	ESG Specialist	Other (please explain):

Q3.12 How many years of investment-related experience do you have? ____ years *If you prefer not to say, leave empty.*

Q3.13 What is your age group?

< 25 years	25-44 years	45-65 years	> 65 years	Prefer not to say

Thank you for participating in this survey. We would like to know any feedback you may have on the survey questions and your experience filling it in. If you have any feedback, please share it below or email it to Vaska Atta-Darkua at v.darkua@jbs.cam.ac.uk

Conclusion

This thesis has conducted several investigations into the exclusion practices employed by investors. It aims to contribute to the existing knowledge in the field by approaching the subject from multiple viewpoints. The first chapter examined how firms can be affected by exclusion announcements. In turn, the second chapter analysed the potential implications for investment portfolios when negative screenings are employed. Finally, the third chapter directly queried industry professionals on their opinions on the matter.

The first chapter focused on the ethical exclusions of the Norwegian Sovereign Wealth Fund and documented a negative returns impact on screened firms following the announcements, which was not reversed in the short run. This was accompanied by modest mimicking divesting behaviour by other ethics-sensitive investors. Therefore, the chapter concluded that firm equity value can be negatively affected by exclusion announcements. This impact is likely to be connected to the observed reduction in firm investor base.

Next, the second chapter discussed the potential costs of sector exclusion strategies for a long-term well-diversified investor, and found them to be non-trivial. The analysis focused on the part of the portfolio which is being negatively screened and replaced by alternative assets. Using a dataset from 1900 to 2018 for the UK and USA, a simple exclusion strategy where an investor effectively goes short a particular sector and long the equity market was found to be subject to substantial drawdowns over time. Additionally, due to large country concentration within some sectors, such a strategy would introduce unwanted geographical tilts to the investor portfolio.

The third and final chapter of the dissertation conducted a survey on industry professionals in order to establish their views on the topic of exclusions. Respondents rated divestment most useful for attracting funds from ethically concerned investors, followed by conforming to moral beliefs. In contrast, the least popular use was risk management. We also grouped our sample into three groups based on their exclusion beliefs - “sceptics”, “questioners”, and “devotees”. We found that “sceptics” form sector risk estimates with higher resemblance to historic performances than divestment “devotees”. Moreover, scepticism towards negative screenings did not seem to stem from an expectation that controversial stocks have superior performance.

Overall, I believe that the research described in the dissertation is important as it sheds light on the topic of ethical and investment exclusions. The thesis results can prove useful both to firms which are at risk of exclusion or have already been divested as well as to investors currently employing negative screenings or considering it as a practice to engage in.

References

Atta-Darkua, V. and Dimson, E. (2018), Sector exclusion, *in* Ø. Thøgersen, ed., 'NOU 2018: 12 Energiaksjer i Statens pensjonsfond utland [Energy shares in the Government Pension Fund Global]', Oslo: Norwegian Ministry of Finance, p. 117–134.

Dimson, E., Marsh, P. R. and Staunton, M. (2015), *Credit Suisse Global Investment Returns Yearbook 2015*, Credit Suisse Research Institute.